NAS Enterprise Architecture

Infrastructure Roadmaps Version 11.1

Aircraft—New Entrants—Automation—Airport—Weather—Communication—Navigation—Surveillance—Airspace & Procedures—Enterprise Services—Facilities—Human Systems Integration—Information Systems Security—Safety

APPROVED

April 2017

Federal Aviation Administration

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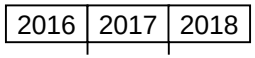
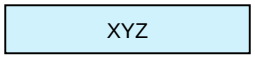
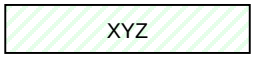
Infrastructure Roadmap Legend



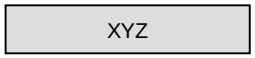
Timeline



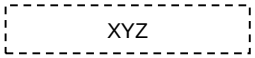
System / Service / Support Activity



Support Activity Owned by Another Domain

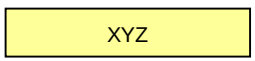


Project



Planned (Unfunded) System/Service/Project*

NextGen Project (denoted by G CIP number)



Operational Node / Procedure / Capability / Other Architecture Object

Decommission

System successor

System in Draw-Down Mode

Decision Point Fill Colors

AMS (CRDR, IARD, IID, FID, BCD)

Policy

Strategy (JRC)

Strategy (Other)

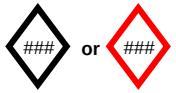
Decision Point Owned by Another Roadmap

Regulatory Milestone

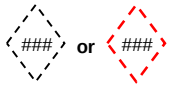
Decision Point Borders**

Future Baselined Decision Point; High Priority

Future Baselined Decision Point; Non-High Priority



Completed Decision Point



Planning Decision Point

* Applies to any fill color type

** Applies to any Decision Point fill color type

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Aircraft

Objective : The Aircraft roadmap presents planned advances in Airframe and Avionics in coordination with NAS NextGen improvements.

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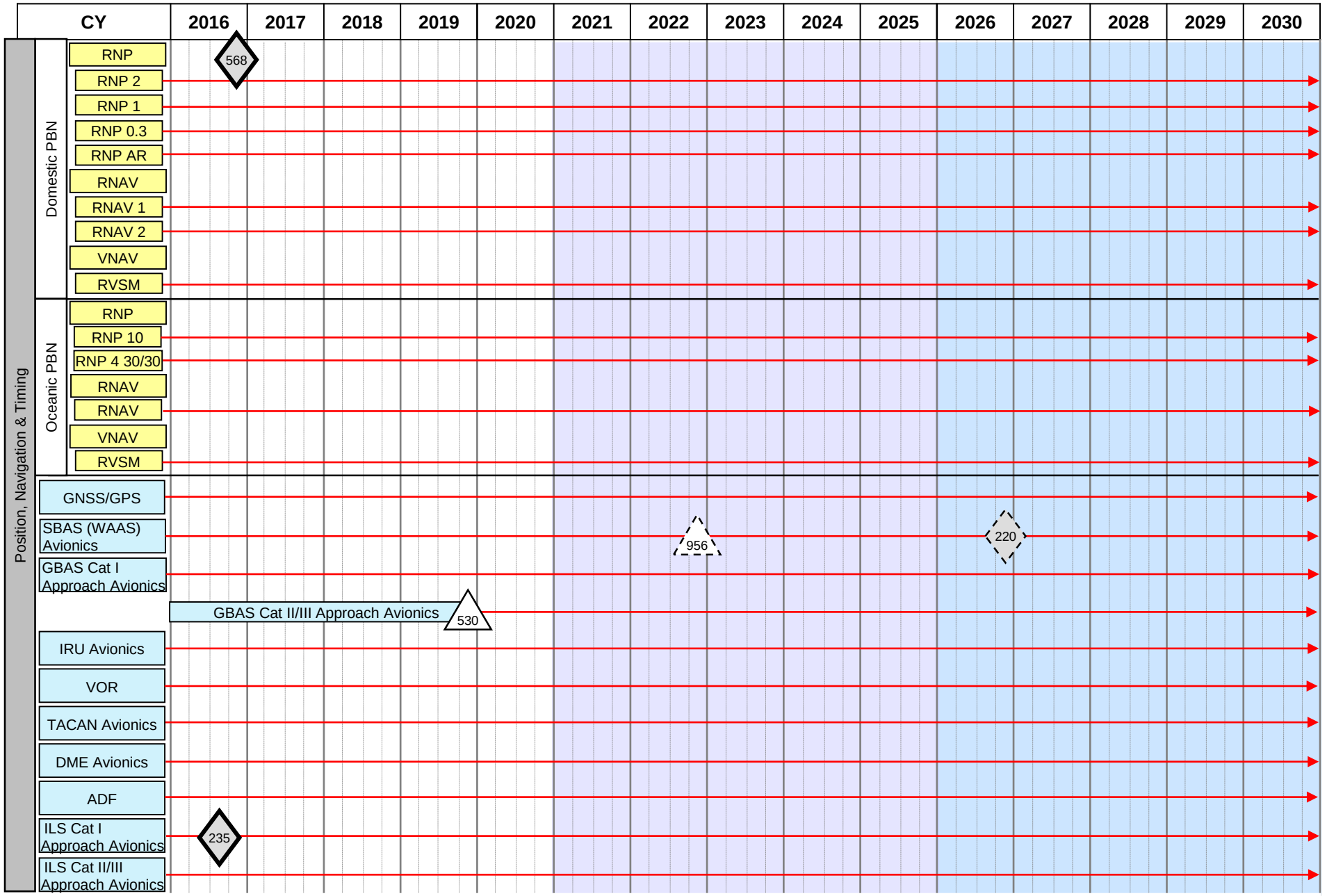
Aircraft Roadmap (1 of 6)



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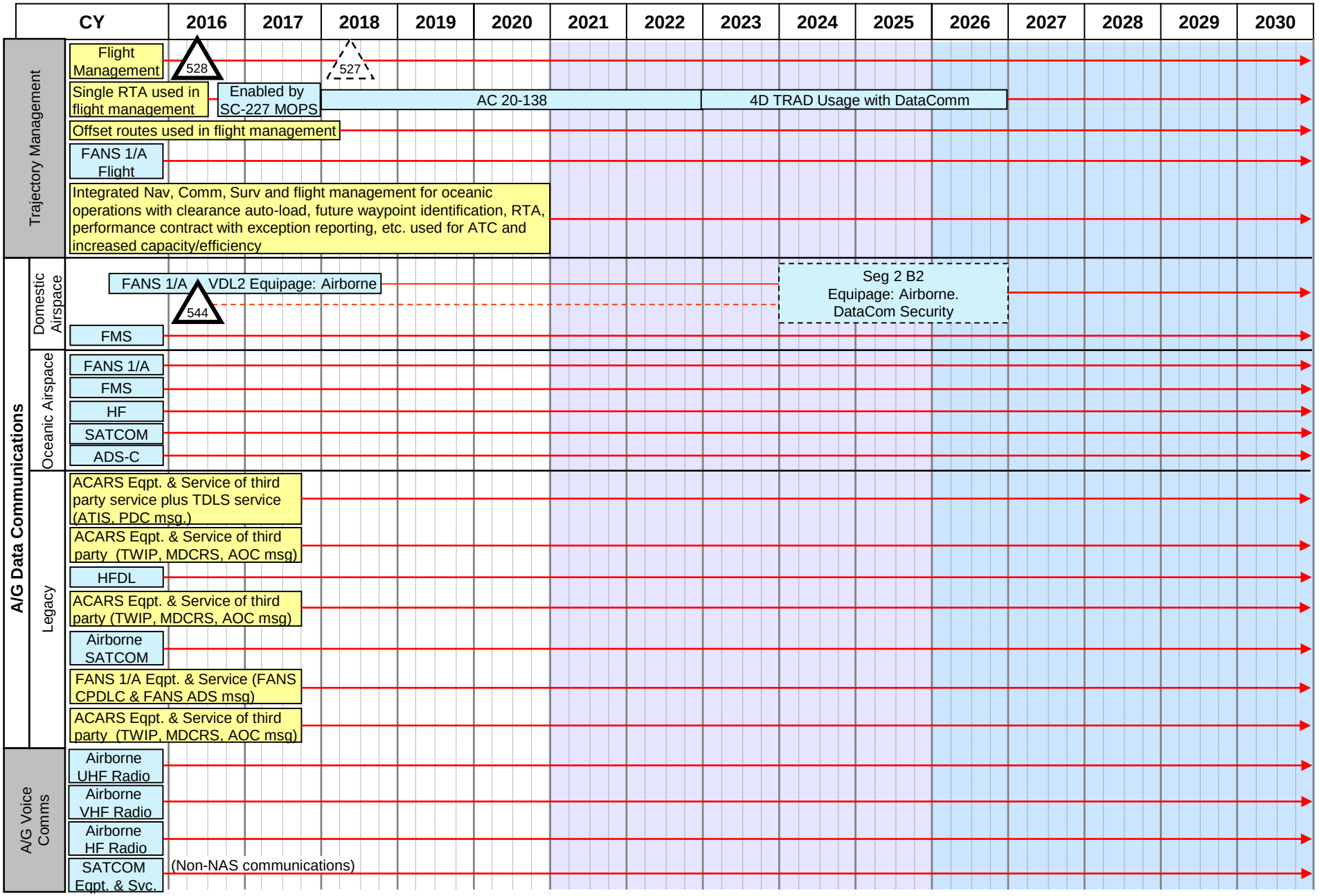
Aircraft Roadmap (2 of 6)



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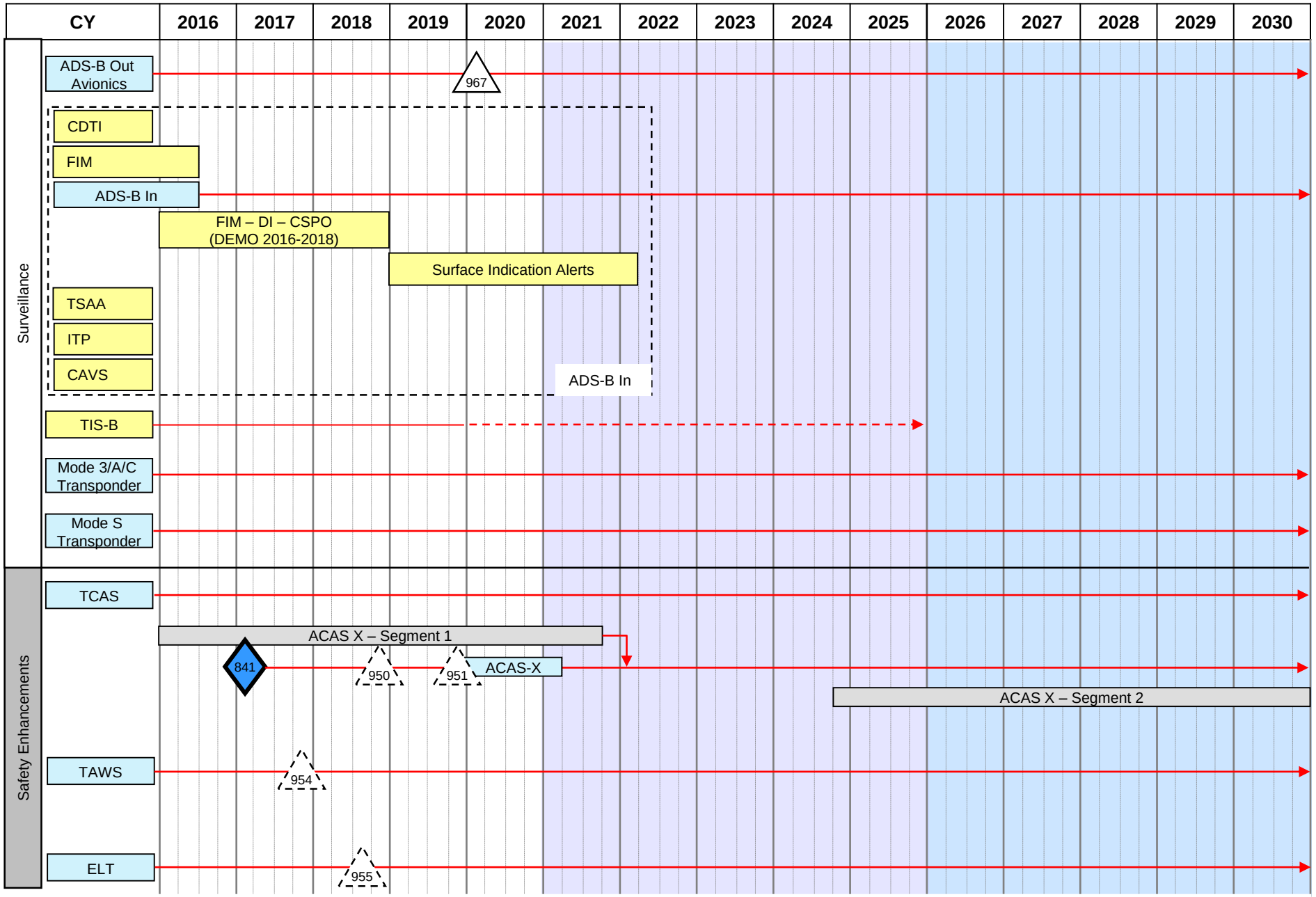
Aircraft Roadmap (3 of 6)



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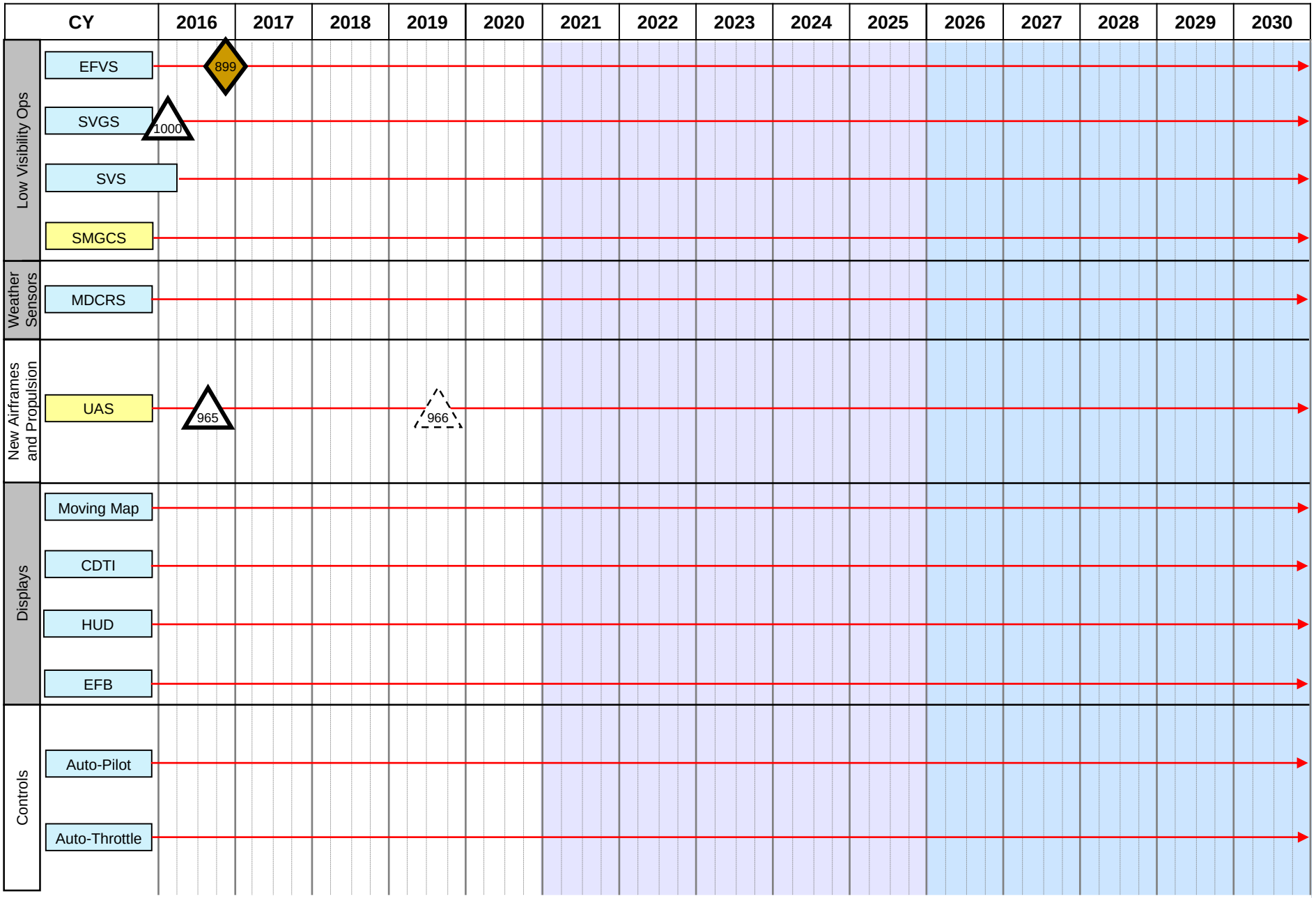
Aircraft Roadmap (4 of 6)



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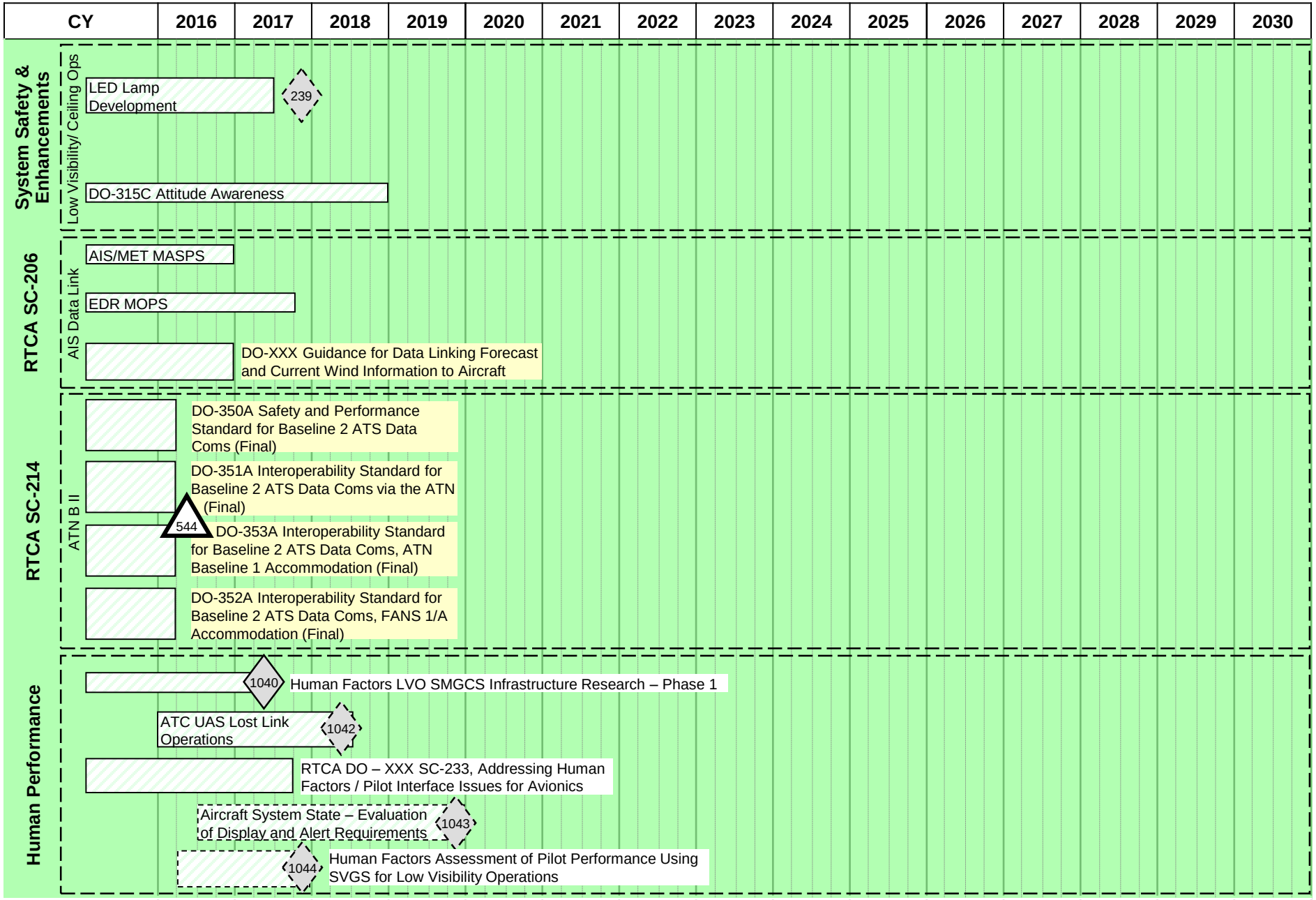
Aircraft Roadmap (5 of 6)



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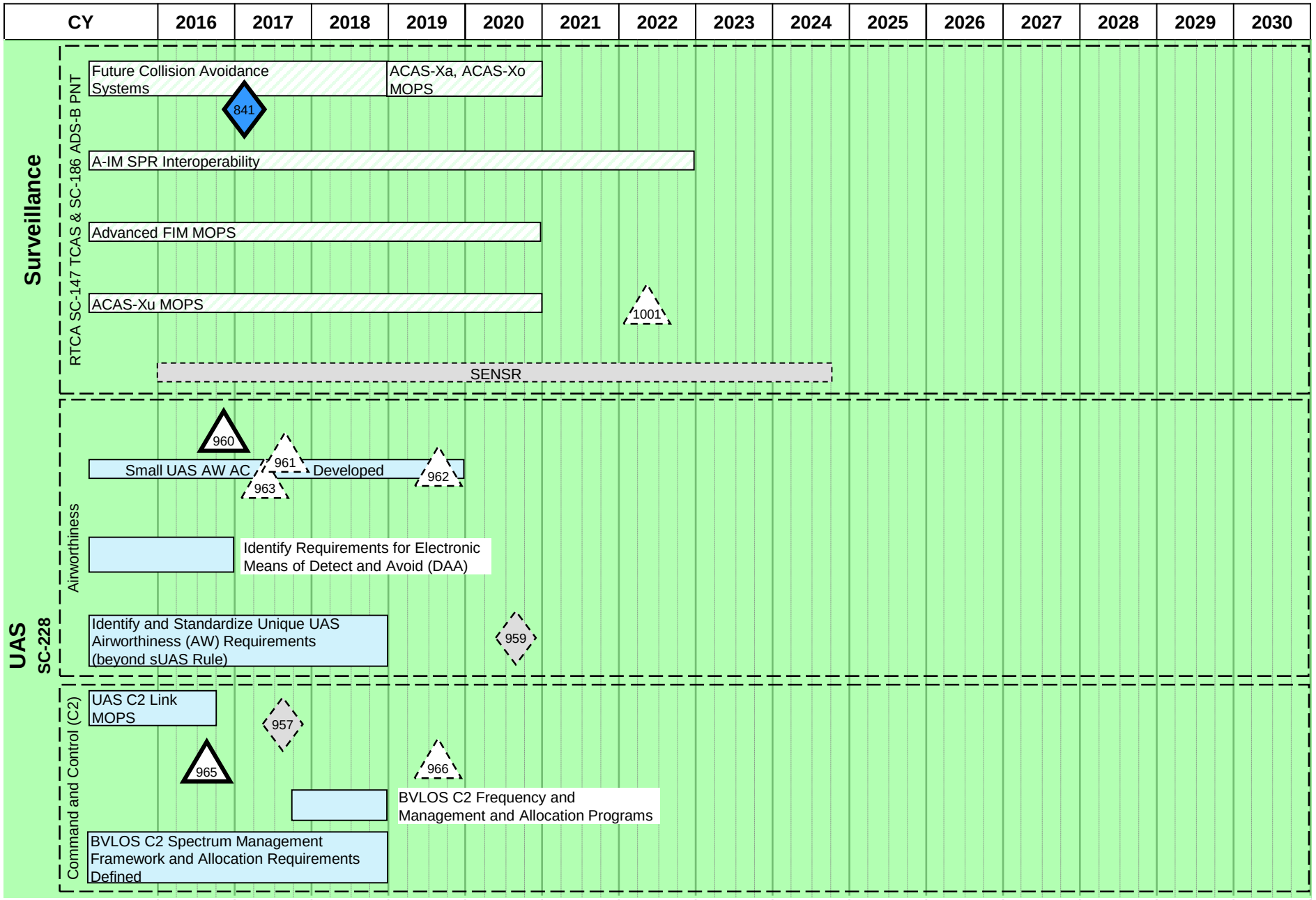
Aircraft Roadmap (6 of 6)



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Aircraft Roadmap: Assumptions

Identifier	Description
AC-01	The roadmap identifies four phases a) CONOPs development and R&D in required areas b) Standards development c) AVS Approval d) ATC Procedure development e) Deployment. After the standards process is complete, and manufacturers have developed, integrated, fully tested and made new avionics available, aircraft, engines and fuels available, an additional 7 to 10 years is needed to achieve wide scale equipage of a new capability 1. Different aircraft are expected to equip with different equipment. This roadmap does not currently distinguish between aircraft types.
AC-02	The aircraft roadmap includes environment research areas and assumptions and linkage to Non-NAS EA.
AC-03	Any aircraft to include any UAS that participates in the NAS must operate in a way that is transparent to the ANSP and ATSP.

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Aircraft Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
220	2026 Q4	No	Navigation	Strategy (Other)	Decision to Cut Over to Dual Frequency / Multi-Constellation Operations Based on Completion of Dual Frequency (GPS L1 and L5) Development & Testing.
235	2016 Q3	No	Navigation	Strategy (JRC)	Strategy Decision on Rationalization of CAT I ILSs Operating in the NAS
239	2017 Q4	No	Navigation	Strategy (Other)	Strategy Decision to Proceed with ALS (I) Production LED Lamps for MALSR Systems
527	2018 Q2	No	Aircraft	Regulatory Milestone	Publication of a Proposed Set of Trajectory Management Performance Levels
528	2016 Q2	No	Aircraft	Regulatory Milestone	Publication of Initial Guidance for NextGen FMS
530	2019 Q4	No	Aircraft	Regulatory Milestone	Publication of Updated MOPS for GBAS CAT III
544	2016 Q2	No	Aircraft	Regulatory Milestone	Publication of Guidance Under SC-214 for Avionics
568	2016 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Implementation Strategy for Human Factors Guidelines for NextGen Instrument Procedures
841	2017 Q1	No	Aircraft	Strategy (Other)	Strategy Decision to Move Forward on WP2 for UAS GA Collision Avoidance (ACAS-Xu and ACAS-Xp)
899	2016 Q4	No	Aircraft	Policy	Rule Making for EFVS to be Used to Touchdown
950	2018 Q4	No	Aircraft	Regulatory Milestone	ACAS-X Segment 1 MOPS
951	2019 Q4	No	Aircraft	Regulatory Milestone	TSO ACAS-X
954	2017 Q4	No	Aircraft	Regulatory Milestone	TSO-C151d: Terrain Awareness and Warning System (TAWS)
955	2018 Q3	No	Aircraft	Regulatory Milestone	TSO-C126c: Emergency Locator Transmitter (ELT)
956	2022 Q4	No	Aircraft	Regulatory Milestone	Publication of SBAS Dual-Frequency/Multi-Constellation (DFMC) MOPS
957	2017 Q3	No	New Entrants	Strategy (Other)	C2 Protected Spectrum Management and Allocation Systems Acquisition Strategy Determined
959	2020 Q3	No	New Entrants	Strategy (Other)	Publish Next UAS Rule (First in Phase 2 of UAS Rulemaking Plan)
960	2016 Q4	No	Aircraft	Regulatory Milestone	Minimum Operational Performance Standards (MOPS) for UAS Detect and Avoid (DAA) - Phase 1 (SC-228)
961	2017 Q3	No	Aircraft	Regulatory Milestone	Advisory Circular (AC) Invoked for Airborne Detect and Avoid (DAA) for UAS - Phase 1

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Aircraft Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
962	2019 Q3	No	Aircraft	Regulatory Milestone	Minimum Operational Performance Standards (MOPS) for UAS Detect and Avoid (DAA) - Phase 2 (SC-228)
963	2017 Q2	No	Aircraft	Regulatory Milestone	Advisory Circular (AC) Invoked for Command and Control for UAS Operations
965	2016 Q3	No	Aircraft	Regulatory Milestone	Terrestrial UAS Command and Control MOPS (SC-228)
966	2019 Q3	No	Aircraft	Regulatory Milestone	Satellite UAS Command and Control MOPS (SC-228)
967	2020 Q1	No	Aircraft	Regulatory Milestone	ADS-B Out Equipage Rule Implemented
1000	2016 Q1	No	Aircraft	Regulatory Milestone	Aircraft Synthetic Vision Guidance System
1001	2022 Q2	No	Aircraft	Regulatory Milestone	TSO ACAS-Xu
1040	2017 Q2	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Human Factors LVO SMGCS Guidelines – Phase 1
1042	2018 Q2	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of ATC UAS Lost Link Guidelines
1043	2019 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Human Factors Aircraft System State Display and Alert Guidelines
1044	2017 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Human Factors SVGS Guidelines

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New Entrants

Objective : The New Entrants roadmap provides a consolidated timeline of activities and investments, both active and planned, required to integrate UAS and Commercial Space into the NAS.

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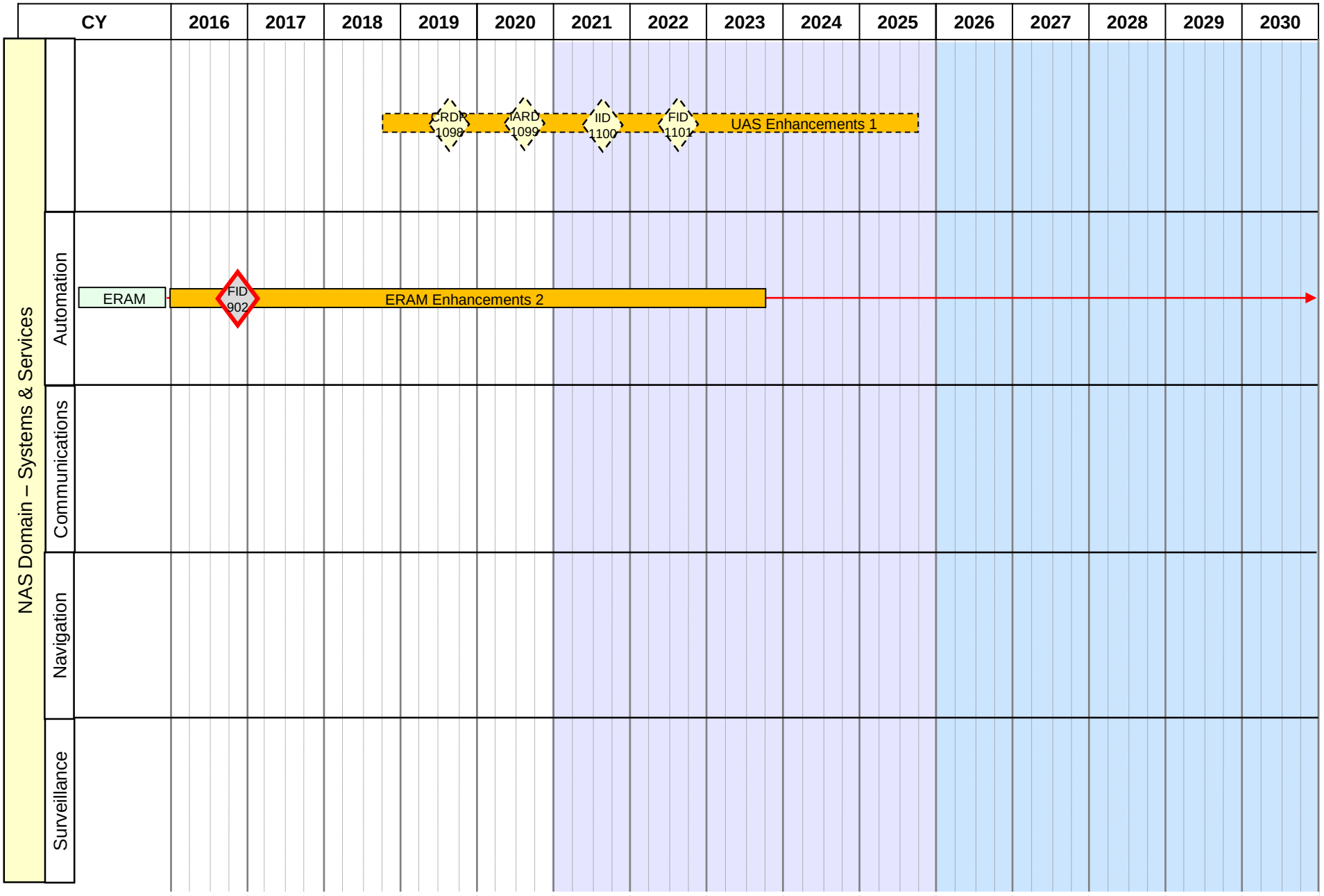
New Entrants Roadmap (1 of 7: UAS)



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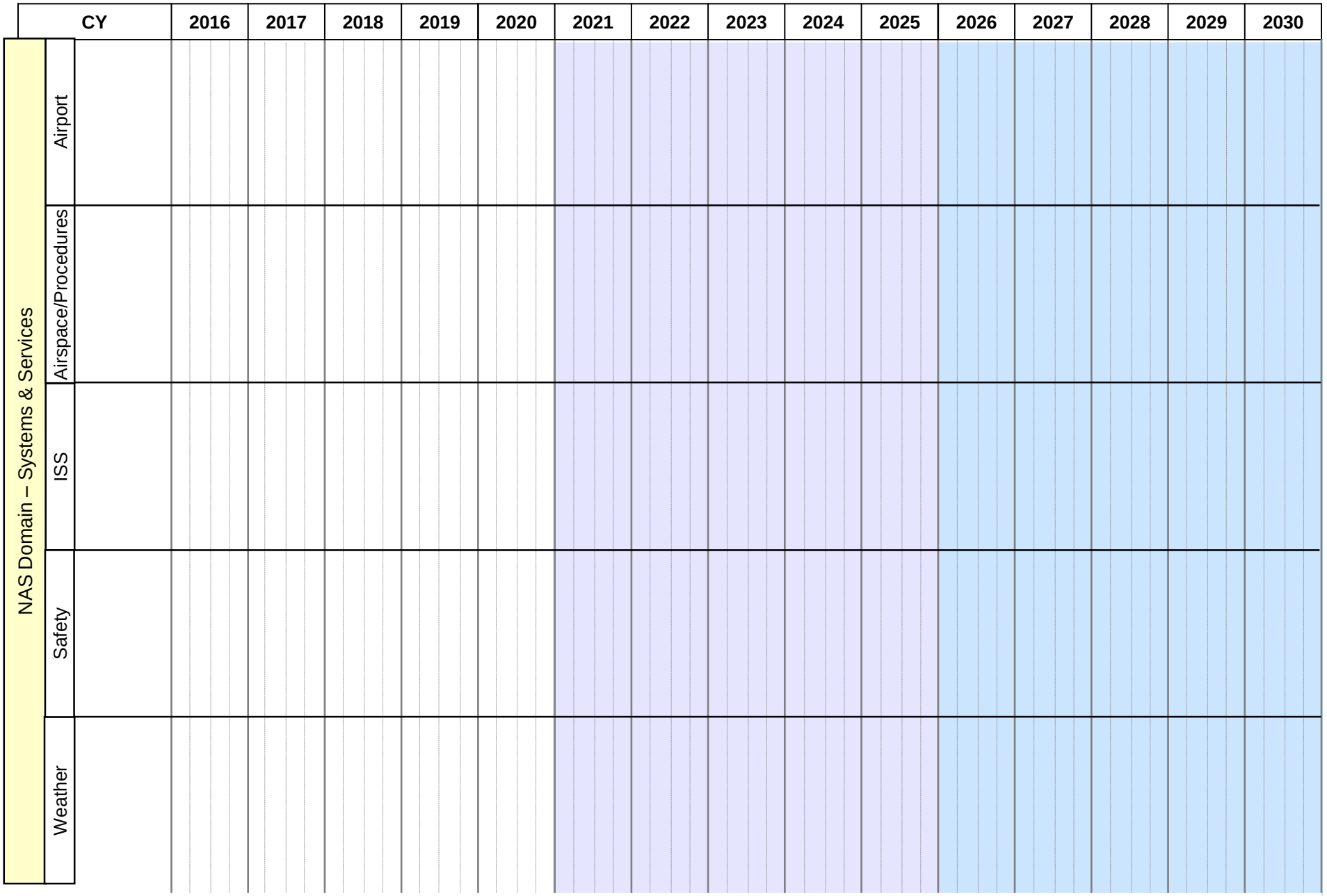
New Entrants Roadmap (2 of 7: UAS)



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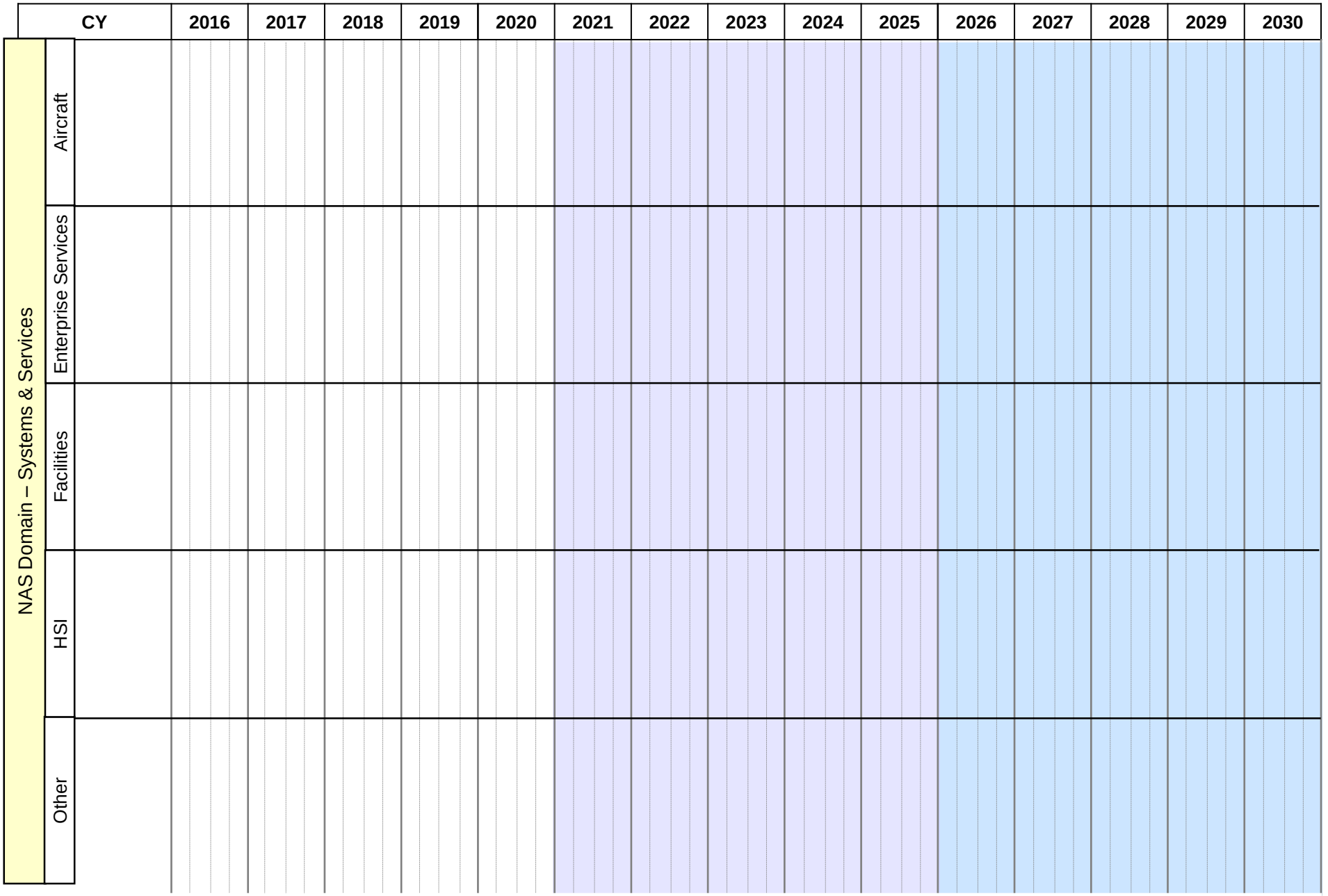
New Entrants Roadmap (3 of 7: UAS)



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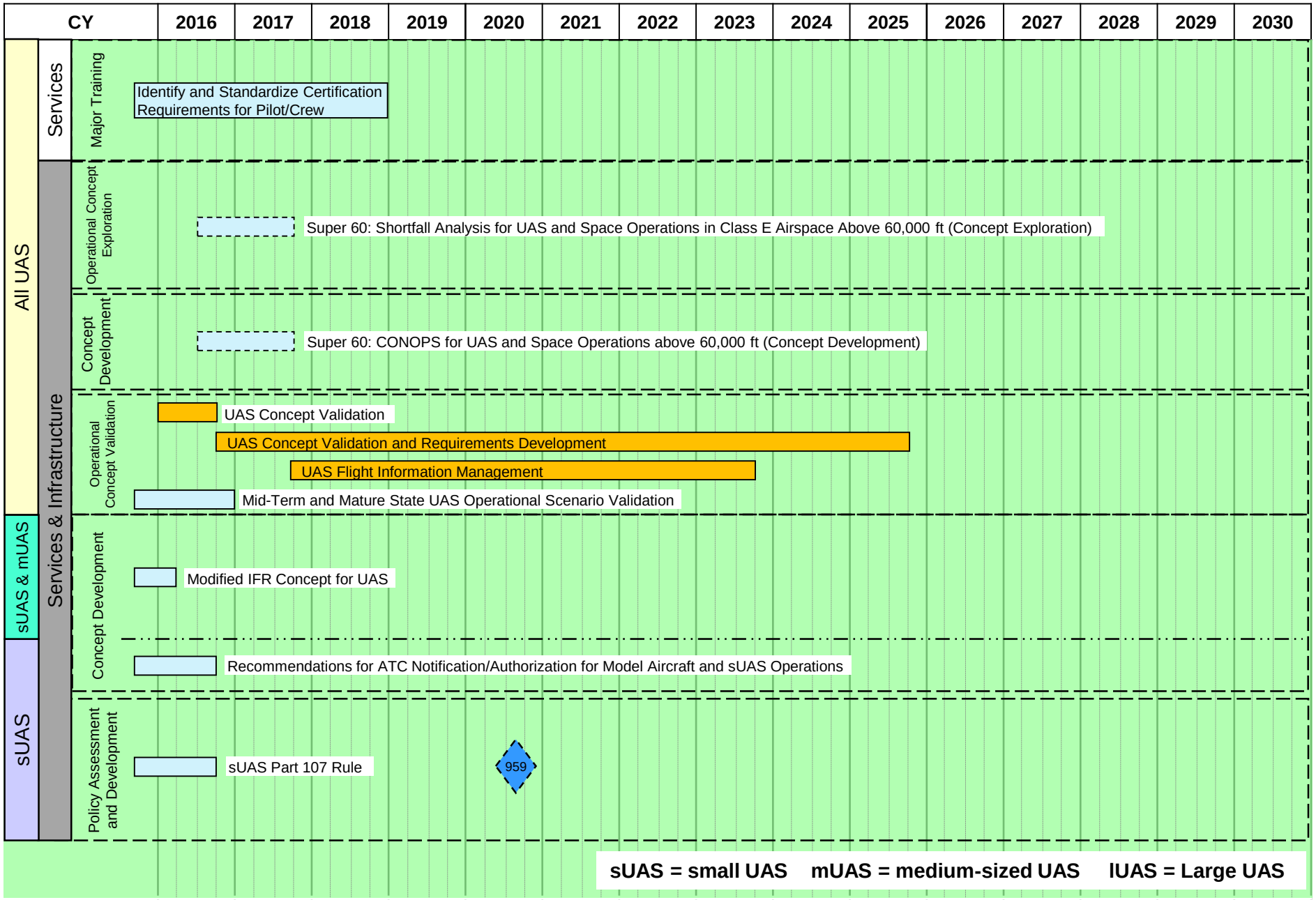
New Entrants Roadmap (4 of 7: UAS)



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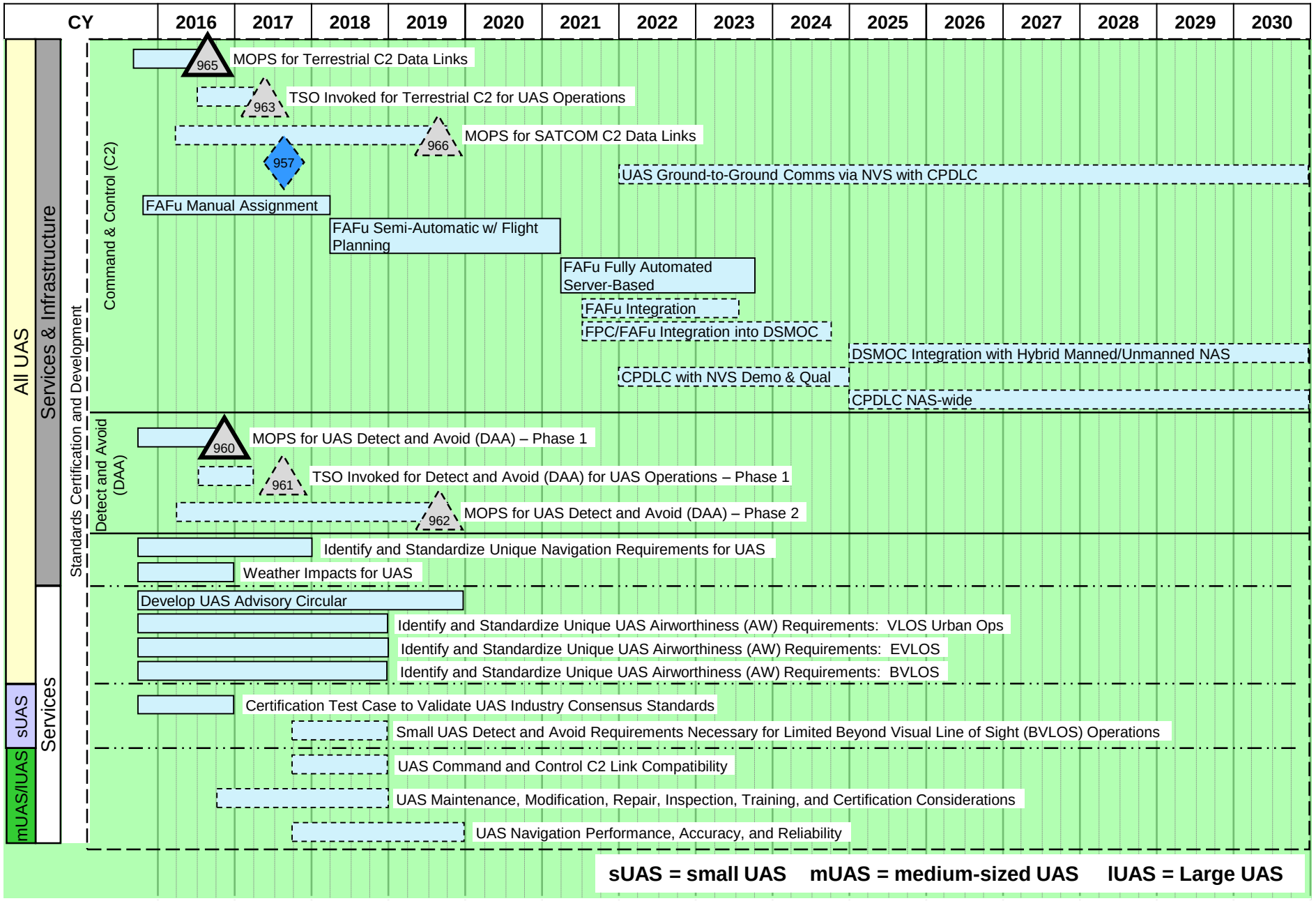
New Entrants Roadmap (5 of 7: UAS)



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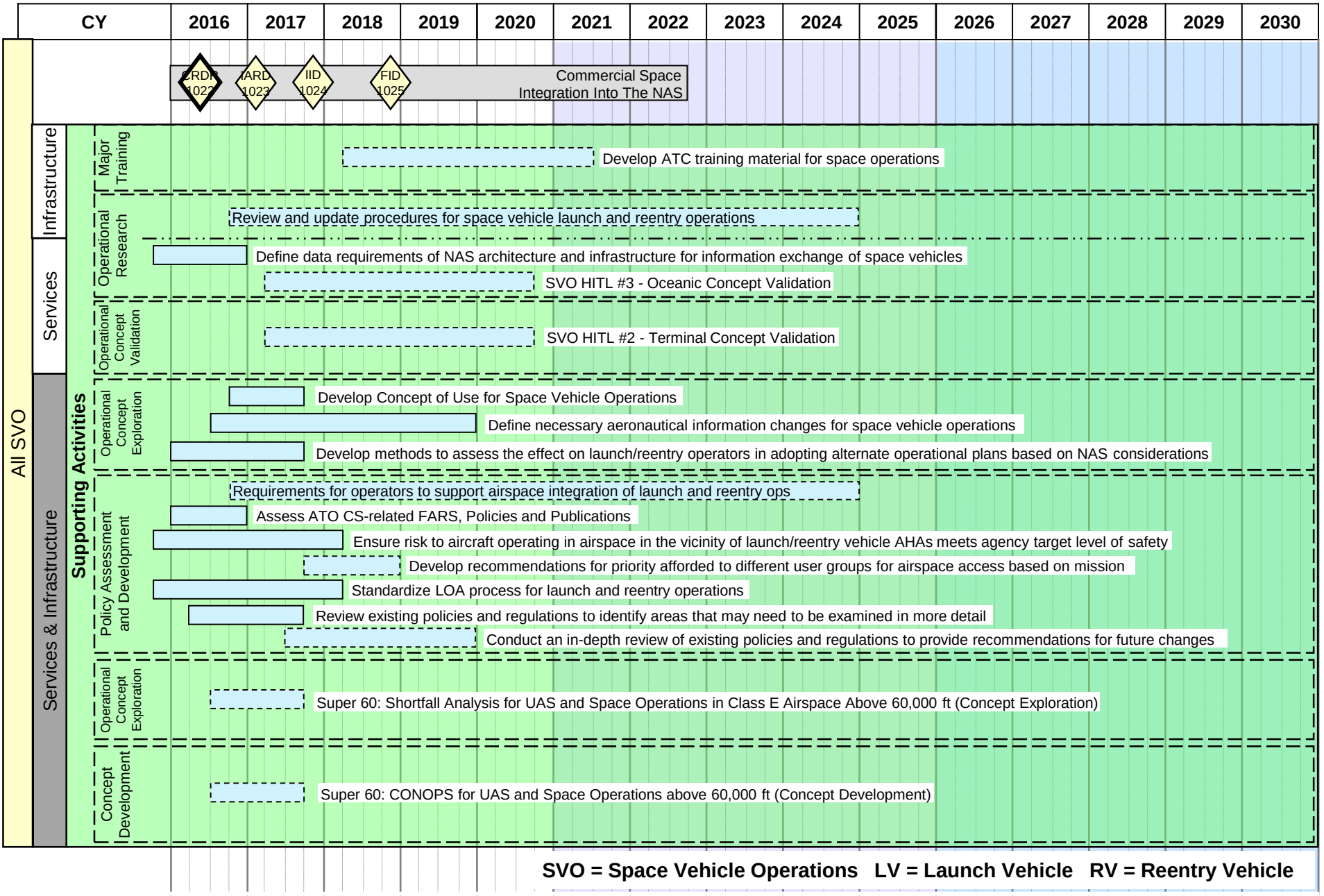
New Entrants Roadmap (6 of 7: Commercial Space)



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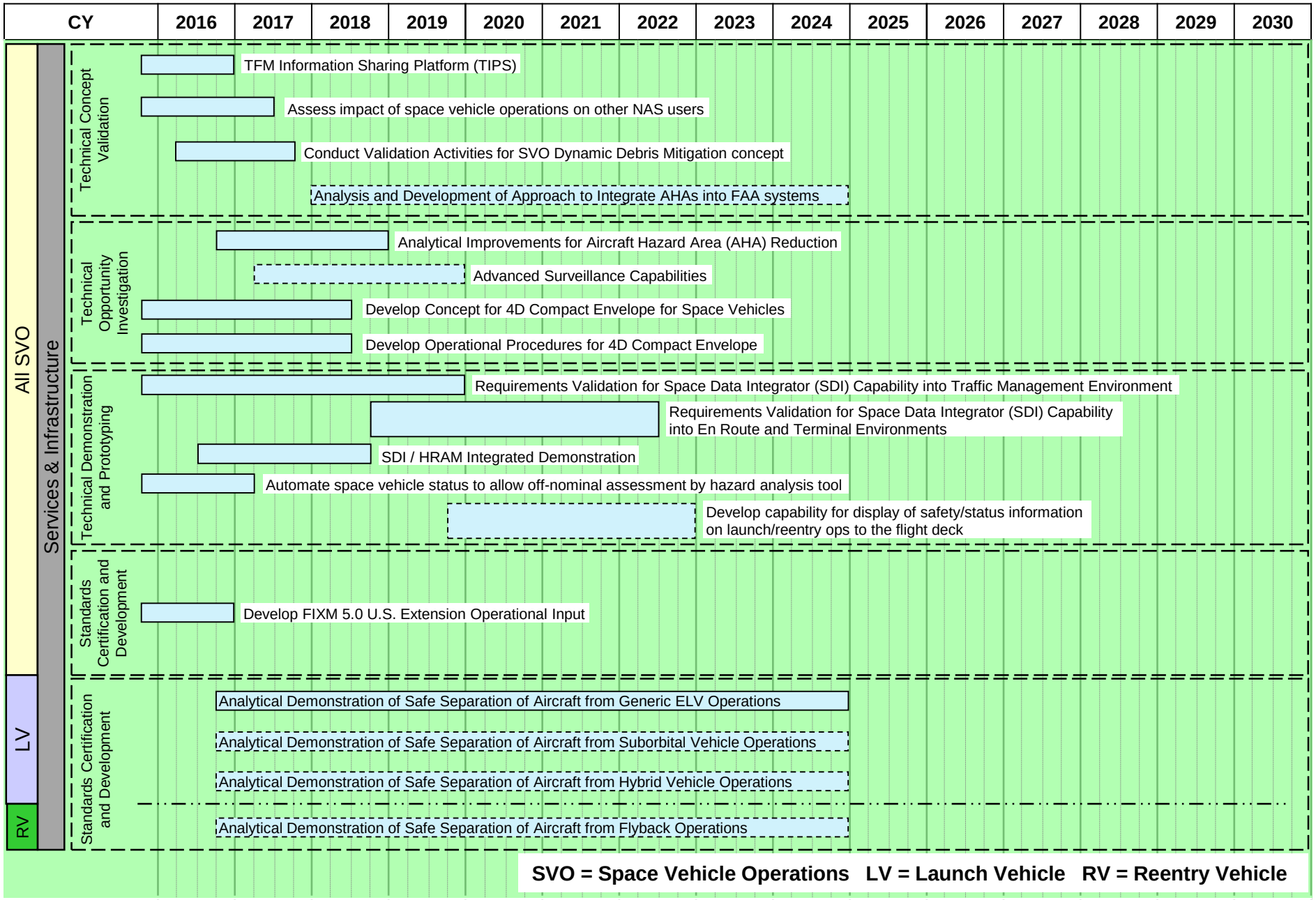
New Entrants Roadmap (7 of 7: Commercial Space)



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New Entrants Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
902	2016 Q4	Yes	Automation	FID	Final Investment Decision (FID) for ERAM Sector Enhancements
957	2017 Q3	No	New Entrants	Strategy (Other)	C2 Protected Spectrum Management and Allocation Systems Acquisition Strategy Determined
959	2020 Q3	No	New Entrants	Strategy (Other)	Publish Next UAS Rule (First in Phase 2 of UAS Rulemaking Plan)
960	2016 Q4	No	Aircraft	Regulatory Milestone	Minimum Operational Performance Standards (MOPS) for UAS Detect and Avoid (DAA) - Phase 1 (SC-228)
961	2017 Q3	No	Aircraft	Regulatory Milestone	Advisory Circular (AC) Invoked for Airborne Detect and Avoid (DAA) for UAS - Phase 1
962	2019 Q3	No	Aircraft	Regulatory Milestone	Minimum Operational Performance Standards (MOPS) for UAS Detect and Avoid (DAA) - Phase 2 (SC-228)
963	2017 Q2	No	Aircraft	Regulatory Milestone	Advisory Circular (AC) Invoked for Command and Control for UAS Operations
965	2016 Q3	No	Aircraft	Regulatory Milestone	Terrestrial UAS Command and Control MOPS (SC-228)
966	2019 Q3	No	Aircraft	Regulatory Milestone	Satellite UAS Command and Control MOPS (SC-228)
1022	2016 Q2	No	New Entrants	CRDR	Concept and Requirements Definition Readiness (CRDR) Decision for Commercial Space Integration Into the NAS
1023	2017 Q1	No	New Entrants	IARD	Investment Analysis Readiness Decision (IARD) for Commercial Space Integration Into the NAS
1024	2017 Q4	No	New Entrants	IID	Initial Investment Decision (IID) for Commercial Space Integration Into the NAS
1025	2018 Q4	No	New Entrants	FID	Final Investment Decision (FID) for Commercial Space Integration Into the NAS
1098	2019 Q3	No	New Entrants	CRDR	Concept and Requirements Definition Readiness (CRDR) Decision for UAS Enhancements 1
1099	2020 Q3	No	New Entrants	IARD	Investment Analysis Readiness Decision (IARD) for UAS Enhancements 1
1100	2021 Q3	No	New Entrants	IID	Initial Investment Decision (IID) for UAS Enhancements 1
1101	2022 Q3	No	New Entrants	FID	Final Investment Decision (FID) for UAS Enhancements 1

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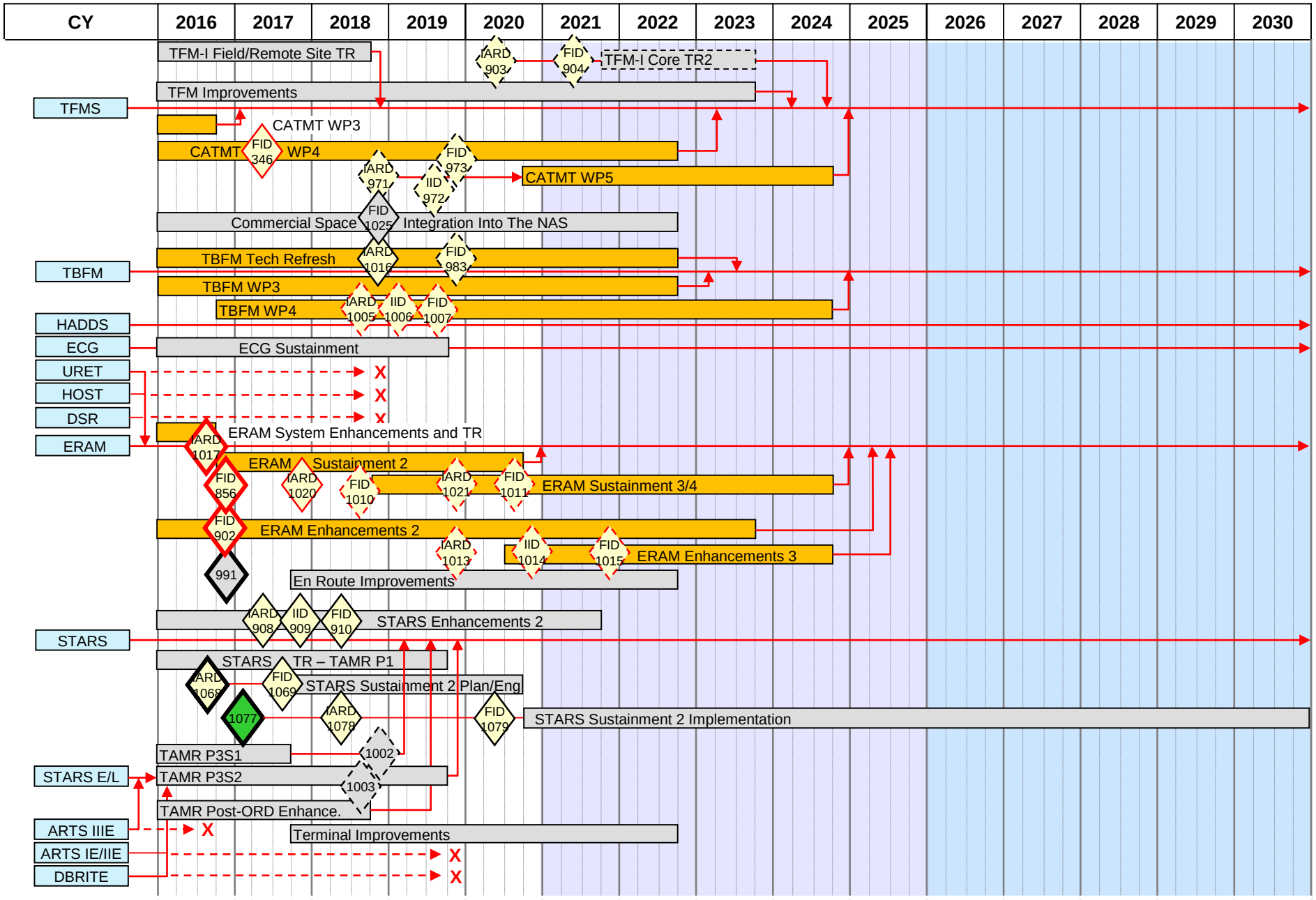
Automation

Objective: The Automation Roadmap presents an Executive View (EV) of the current automation systems supporting the National Airspace System (NAS) and their enhancement, sustainment or replacement through major development programs and support activities. The Automation Roadmap is intended to convey the major automation program strategy and acquisition decision points as well as program execution through the In-Service Decision. The roadmap serves as a summary view of more detailed plans within each development program.

Automation Roadmap (1 of 4)



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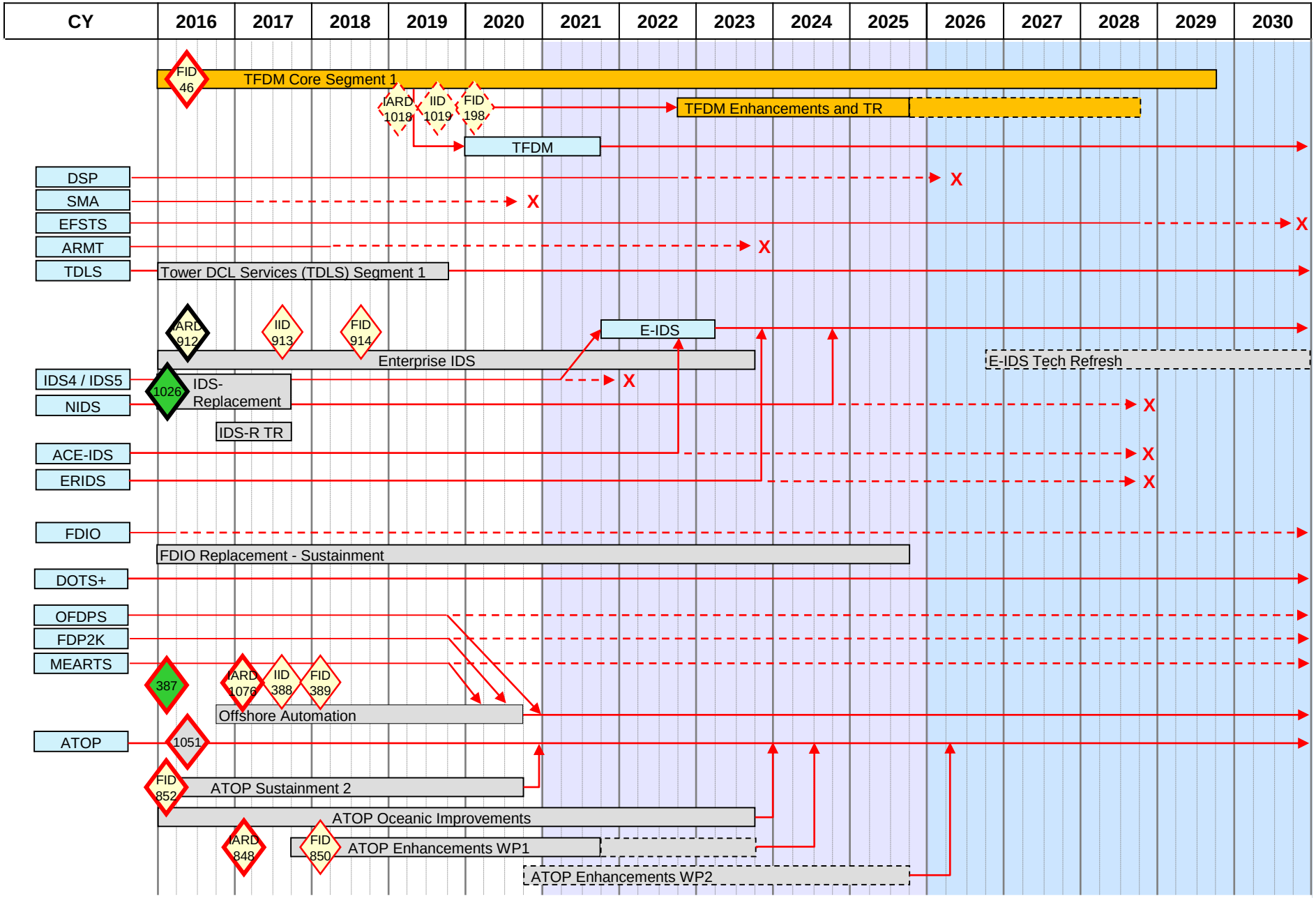
Automation Roadmap (2 of 4)



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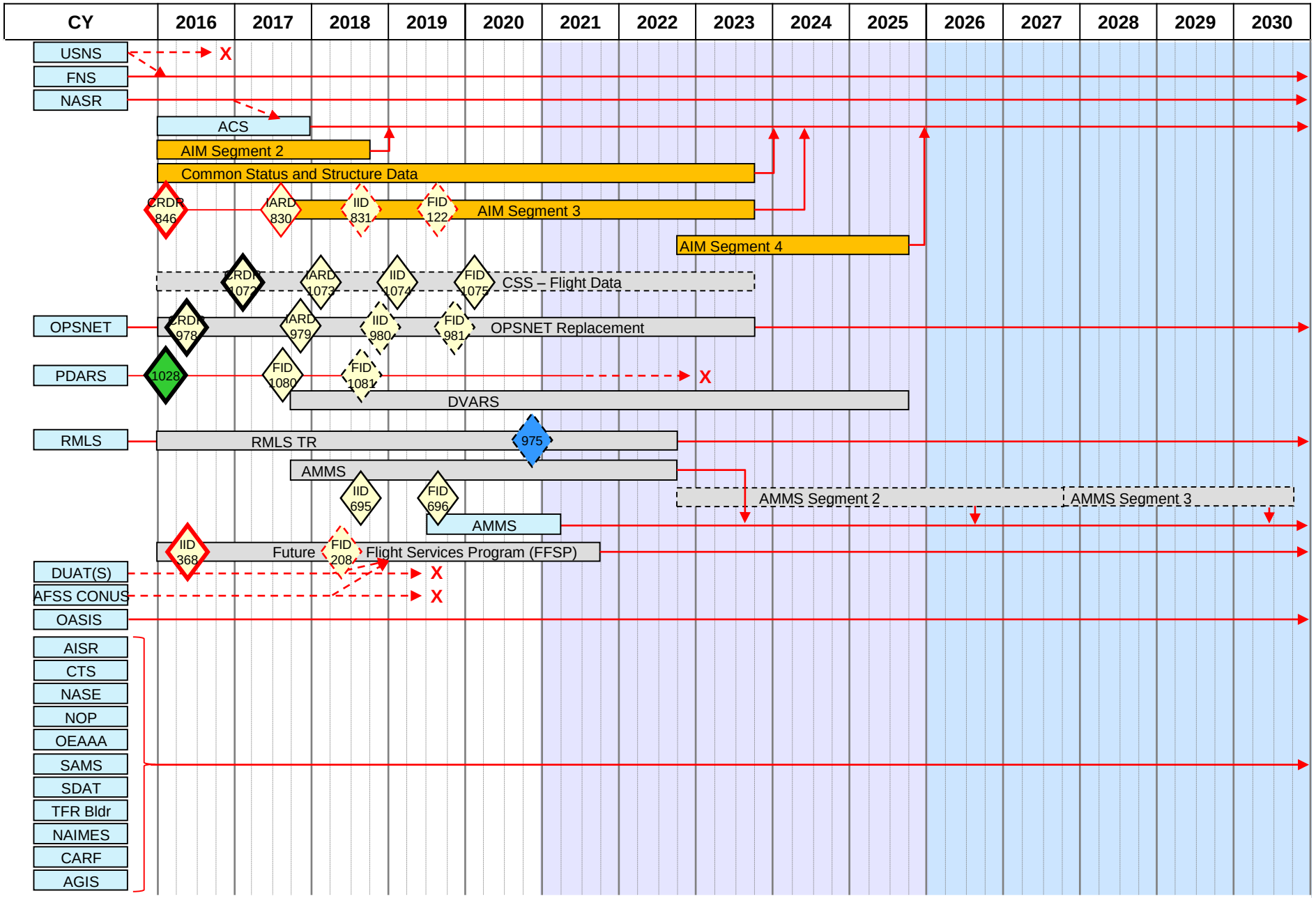
Automation Roadmap (3 of 4)



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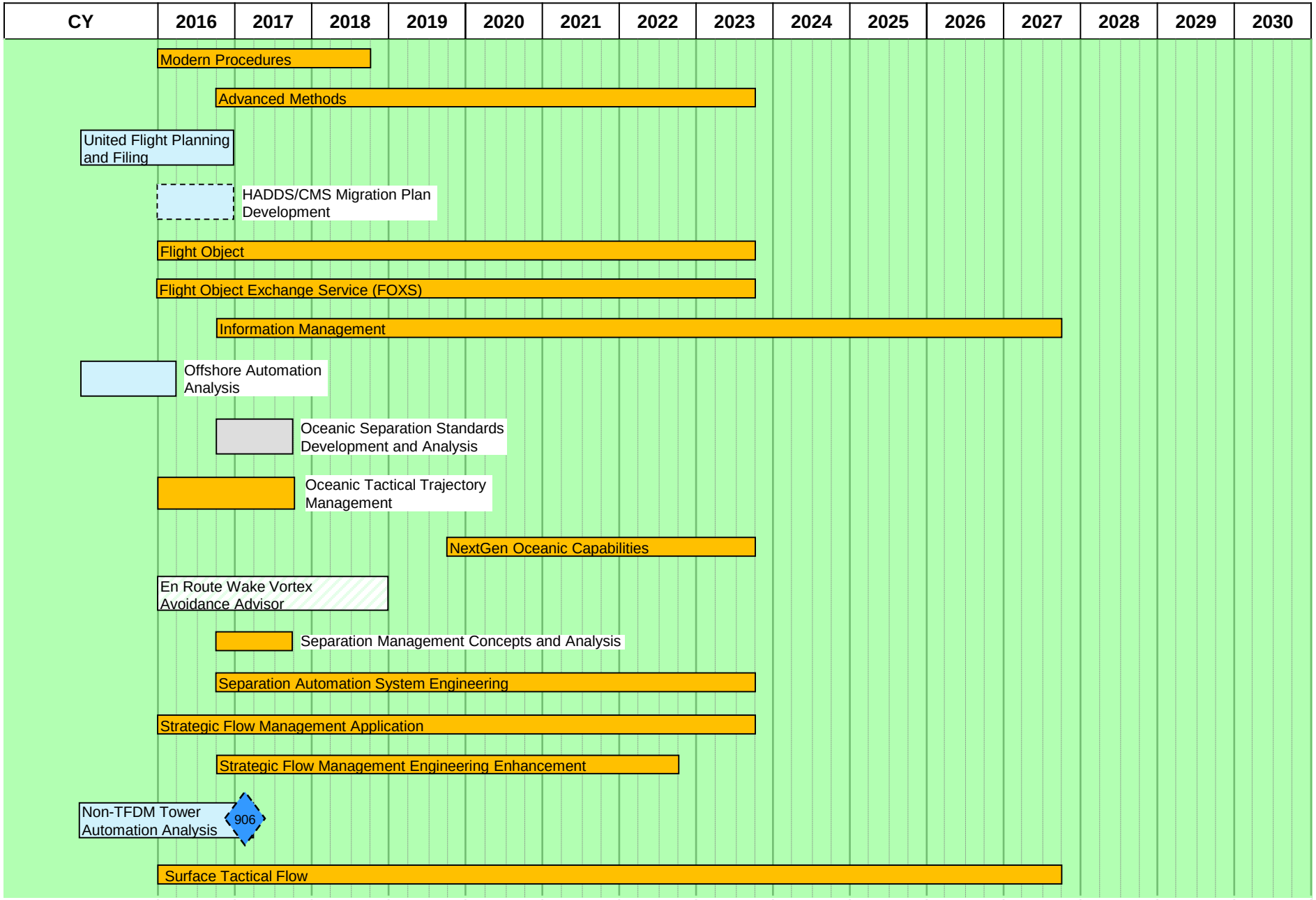
Automation Roadmap (4 of 4)



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Automation Roadmap: Assumptions

Identifier	Description
AUTO-01	Net-centric Enterprise Services will replace designated existing point to point interfaces with a system based on a Service Oriented Architecture providing enhanced data exchange, enhanced flexibility, and enhanced security for FAA Operations Personnel, and airspace users within a common information environment to support NextGen Operational Improvements.
AUTO-02	ADS-B is a necessary infrastructure element to support Trajectory Based Operations, Flexible Terminal, and High Density Terminal solution sets.
AUTO-03	Data Communication is a necessary infrastructure element to support Trajectory Based Operations, Flexible Terminal, and High Density Terminal solution sets.
AUTO-04	Operational Service Units will be responsible for JRC Final Investment Decisions.
AUTO-05	Policy and standards decisions prescribing the use of hand-held devices for data messaging by General Aviation pilots and aircraft are established.
AUTO-06	Consistent security management across Data Communication, Automation and SWIM support the evolution.
AUTO-07	Human-system integration will be conducted during analysis, design, development, and testing of Automation programs.
AUTO-08	Safety analysis and considerations will be included in all applicable phases of Automation analysis, design, development, and testing and platforms will provide data as required for safety monitoring and analysis.
AUTO-09	Automation platform designs will support environmental and energy saving initiatives.

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Automation Roadmap: Decision Points (1 of 4)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
46	2016 Q2	Yes	Automation	FID	Final Investment Decision (FID) for Terminal Flight Data Manager (TFDM) Segment 1
122	2019 Q3	Yes	Automation	FID	Final Investment Decision (FID) for AIM Segment 3
198	2020 Q1	Yes	Automation	FID	Final Investment Decision (FID) for TFDM Segment 2
208	2018 Q2	Yes	Automation	FID	Final Investment Decision (FID) for Future Flight Services Program (FFSP)
346	2017 Q2	Yes	Automation	FID	Final Investment Decision (FID) for CATMT Work Package 4
368	2016 Q2	Yes	Automation	IID	Initial Investment Decision (IID) for Future Flight Services Program (FFSP)
387	2016 Q1	Yes	Automation	Strategy (JRC)	Strategy Decision for Offshore Automation System
388	2017 Q3	Yes	Automation	IID	Initial Investment Decision (IID) for Offshore Automation System
389	2018 Q1	Yes	Automation	FID	Final Investment Decision (FID) for Offshore Automation System
695	2018 Q3	No	Automation	IID	Initial Investment Decision (IID) for AMMS Segment 1
696	2019 Q3	No	Automation	FID	Final Investment Decision (FID) for AMMS Segment 1
830	2017 Q3	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for AIM Segment 3
831	2018 Q3	Yes	Automation	IID	Initial Investment Decision (IID) for AIM Segment 3
846	2016 Q1	Yes	Automation	CRDR	Concept and Requirements Definition Readiness (CRDR) for AIM Segment 3
848	2017 Q1	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for ATOP Enhancements WP1
850	2018 Q1	Yes	Automation	FID	Final Investment Decision (FID) for ATOP Enhancements WP1
852	2016 Q1	Yes	Automation	FID	Final Investment Decision (FID) for ATOP Tech Refresh
856	2016 Q4	Yes	Automation	FID	Final Investment Decision (FID) for ERAM Tech Refresh Segment 1
902	2016 Q4	Yes	Automation	FID	Final Investment Decision (FID) for ERAM Sector Enhancements

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Automation Roadmap: Decision Points (2 of 4)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
903	2020 Q2	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TFM-I Core TR2
904	2021 Q2	No	Automation	FID	Final Investment Decision (FID) for TFM-I Core TR2
906	2017 Q1	No	Automation	Strategy (Other)	Strategy Decision for Tower Automation at Non-TFDM Sites
908	2017 Q2	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for Terminal WP1
909	2017 Q4	No	Automation	IID	Initial Investment Decision (IID) for Terminal WP1
910	2018 Q2	No	Automation	FID	Final Investment Decision (FID) for Terminal WP1
912	2016 Q2	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for Enterprise Information Display System (E-IDS)
913	2017 Q3	Yes	Automation	IID	Initial Investment Decision (IID) for Enterprise Information Display System (E-IDS)
914	2018 Q3	Yes	Automation	FID	Final Investment Decision (FID) for Enterprise Information Display System (E-IDS)
971	2018 Q4	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for CATMT WP5
972	2019 Q3	No	Automation	IID	Initial Investment Decision (IID) for CATMT WP5
973	2019 Q4	No	Automation	FID	Final Investment Decision (FID) for CATMT WP5
975	2020 Q4	No	Automation	Strategy (Other)	Strategy Decision to Determine Future Relation Between RMLS and AMMS
978	2016 Q2	No	Automation	CRDR	Concept and Requirements Definition Readiness (CRDR) Decision for OPSNET Replacement
979	2017 Q4	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for OPSNET Replacement
980	2018 Q4	No	Automation	IID	Initial Investment Decision (IID) for OPSNET Replacement
981	2019 Q4	No	Automation	FID	Final Investment Decision (FID) for OPSNET Replacement
983	2019 Q4	No	Automation	FID	Final Investment Decision (FID) for TBFM Tech Refresh
991	2016 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Prioritized Common User Interface Requirements for NextGen Terminal and En Route Workstations

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Automation Roadmap: Decision Points (3 of 4)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1002	2018 Q4	No	Airspace & Procedures	Strategy (Other)	Strategy Decision on the Implementation Approach of Single Runway Departure Wake Mitigation Capability
1003	2018 Q3	No	Airspace & Procedures	Strategy (Other)	Strategy Decision on the Implementation Approach of CSPR Paired Departure Wake Mitigation Capability
1005	2018 Q3	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TBFM Work Package 4
1006	2019 Q1	Yes	Automation	IID	Initial Investment Decision (IID) for TBFM Work Package 4
1007	2019 Q3	Yes	Automation	FID	Final Investment Decision (FID) for TBFM Work Package 4
1010	2018 Q3	Yes	Automation	FID	Final Investment Decision (FID) for ERAM Tech Refresh 3
1011	2020 Q3	Yes	Automation	FID	Final Investment Decision (FID) for ERAM Tech Refresh 4
1013	2019 Q4	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for ERAM Sector Enhancements-2
1014	2020 Q4	Yes	Automation	IID	Initial Investment Decision (IID) for ERAM Sector Enhancements-2
1015	2021 Q4	Yes	Automation	FID	Final Investment Decision (FID) for ERAM Sector Enhancements-2
1016	2018 Q4	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TBFM Tech Refresh
1017	2016 Q3	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for ERAM Tech Refresh Segment 1
1018	2019 Q1	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TFDM Segment 2
1019	2019 Q3	Yes	Automation	IID	Initial Investment Decision (IID) for TFDM Segment 2
1020	2017 Q4	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for ERAM Tech Refresh 3
1021	2019 Q4	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for ERAM Tech Refresh 4
1025	2018 Q4	No	New Entrants	FID	Final Investment Decision (FID) for Commercial Space Integration Into the NAS
1026	2016 Q1	No	Automation	Strategy (JRC)	Strategy Decision for Information Display System-Replacement
1028	2016 Q1	No	Automation	Strategy (JRC)	Strategy Decision for Data Visualization and Reporting System (DVARS)

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Automation Roadmap: Decision Points (4 of 4)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1051	2016 Q2	Yes	Surveillance	Strategy (JRC)	Strategy Decision for Ingestion and Processing of Space-Based ADS-B
1068	2016 Q3	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for STARS Technology Refresh Phase 1
1069	2017 Q3	No	Automation	FID	Final Investment Decision (FID) for STARS Technology Refresh Phase 1
1072	2017 Q1	No	Automation	CRDR	Concept and Requirements Definition Readiness (CRDR) Decision for Common Support Services - Flight Data
1073	2018 Q1	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for Common Support Services - Flight Data
1074	2019 Q1	No	Automation	IID	Initial Investment Decision (IID) for Common Support Services - Flight Data
1075	2020 Q1	No	Automation	FID	Final Investment Decision (FID) for Common Support Services - Flight Data
1076	2017 Q1	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for Offshore Automation System
1077	2017 Q1	No	Automation	Strategy (JRC)	Strategy Decision for STARS Tech Refresh 2 Planning
1078	2018 Q2	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for STARS Technology Refresh 2
1079	2020 Q2	No	Automation	FID	Final Investment Decision (FID) for STARS Technology Refresh 2
1080	2017 Q3	No	Automation	FID	Final Investment Decision (FID) for DVARS Segment 1 - Design
1081	2018 Q3	No	Automation	FID	Final Investment Decision (FID) for DVARS Segment 2 - Development and Implementation

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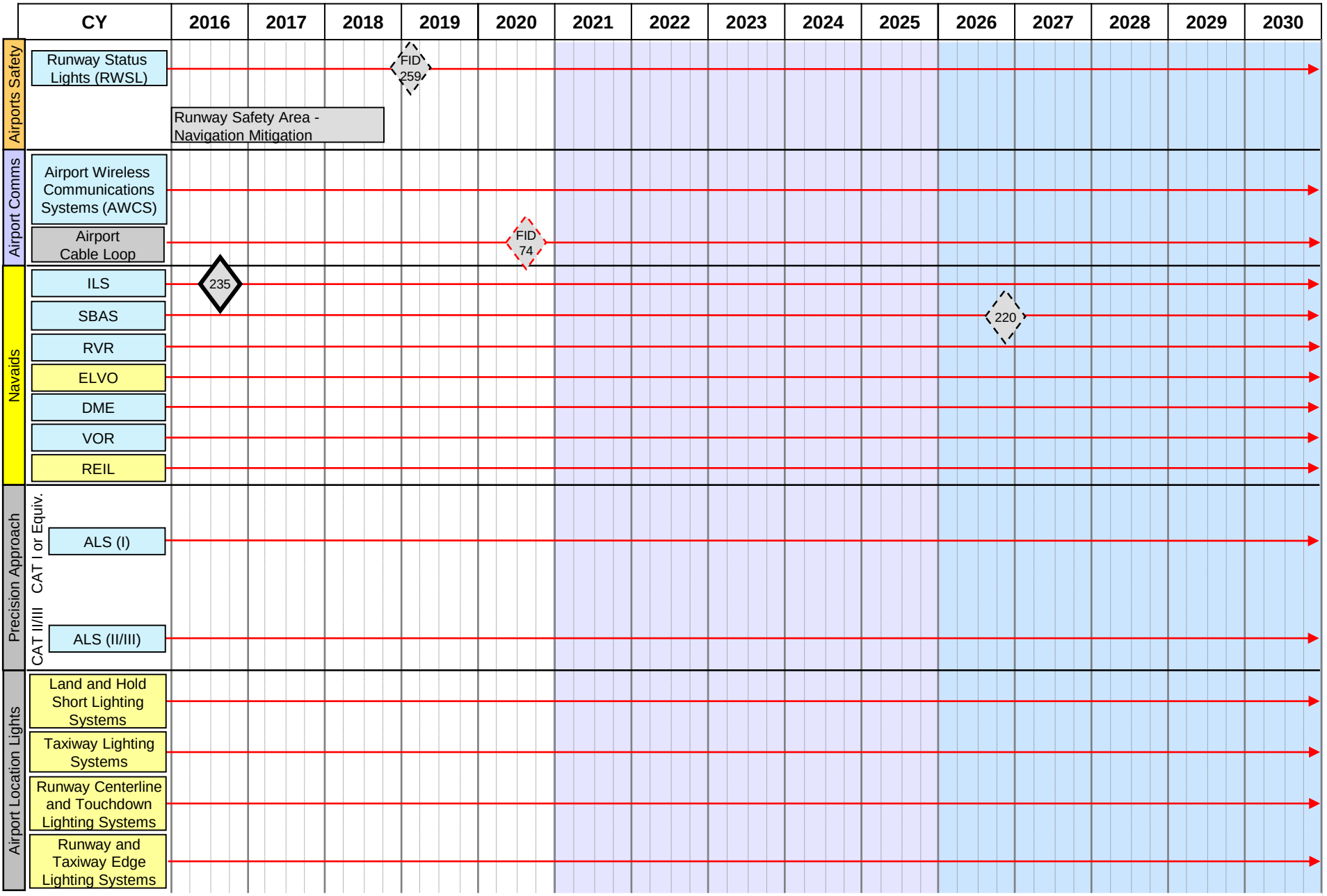
Airport

Objective: The Airport Roadmap identifies NextGen progression of services, procedures and systems in the airport environment.

Airport Roadmap (1 of 3)



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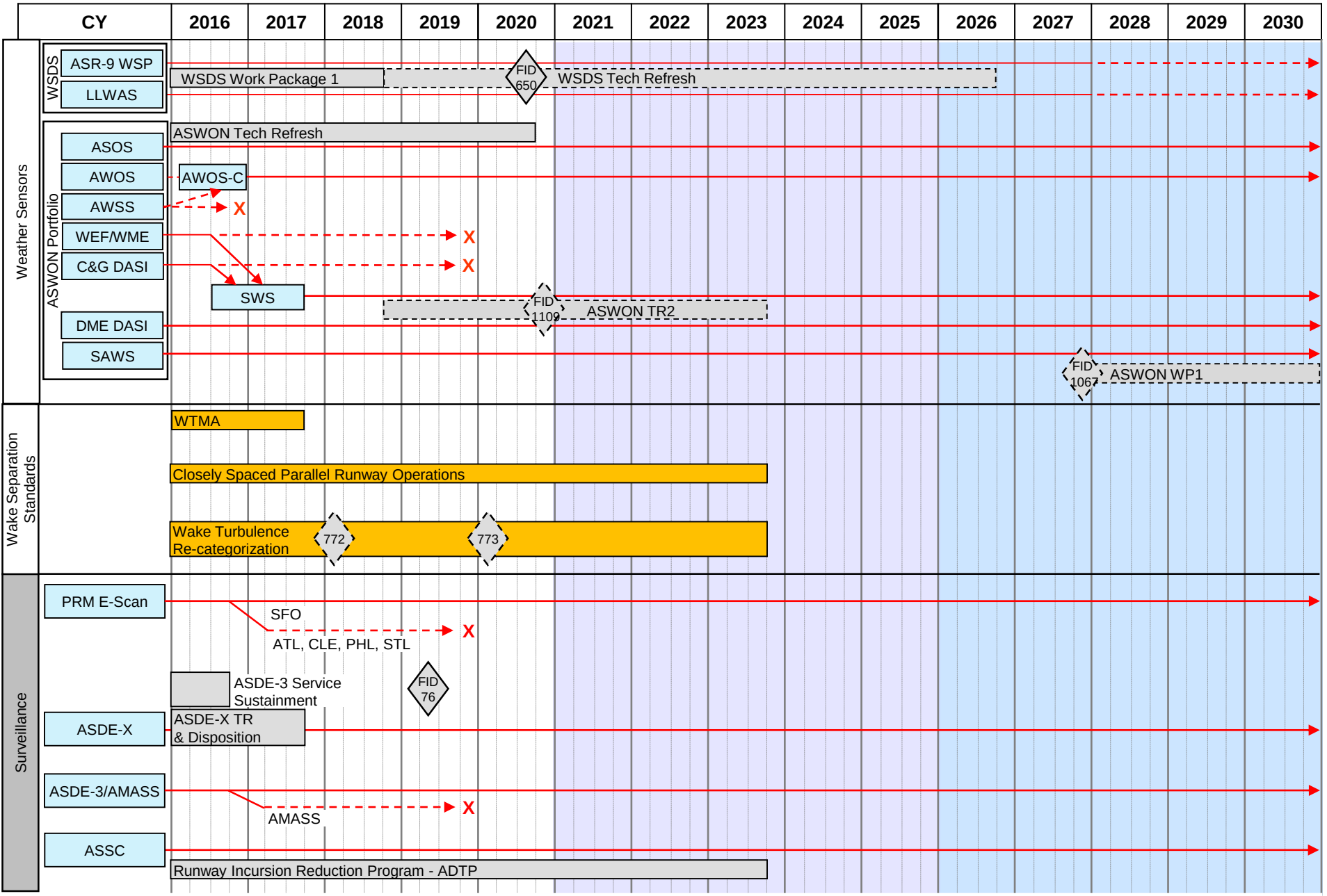
Airport Roadmap (2 of 3)



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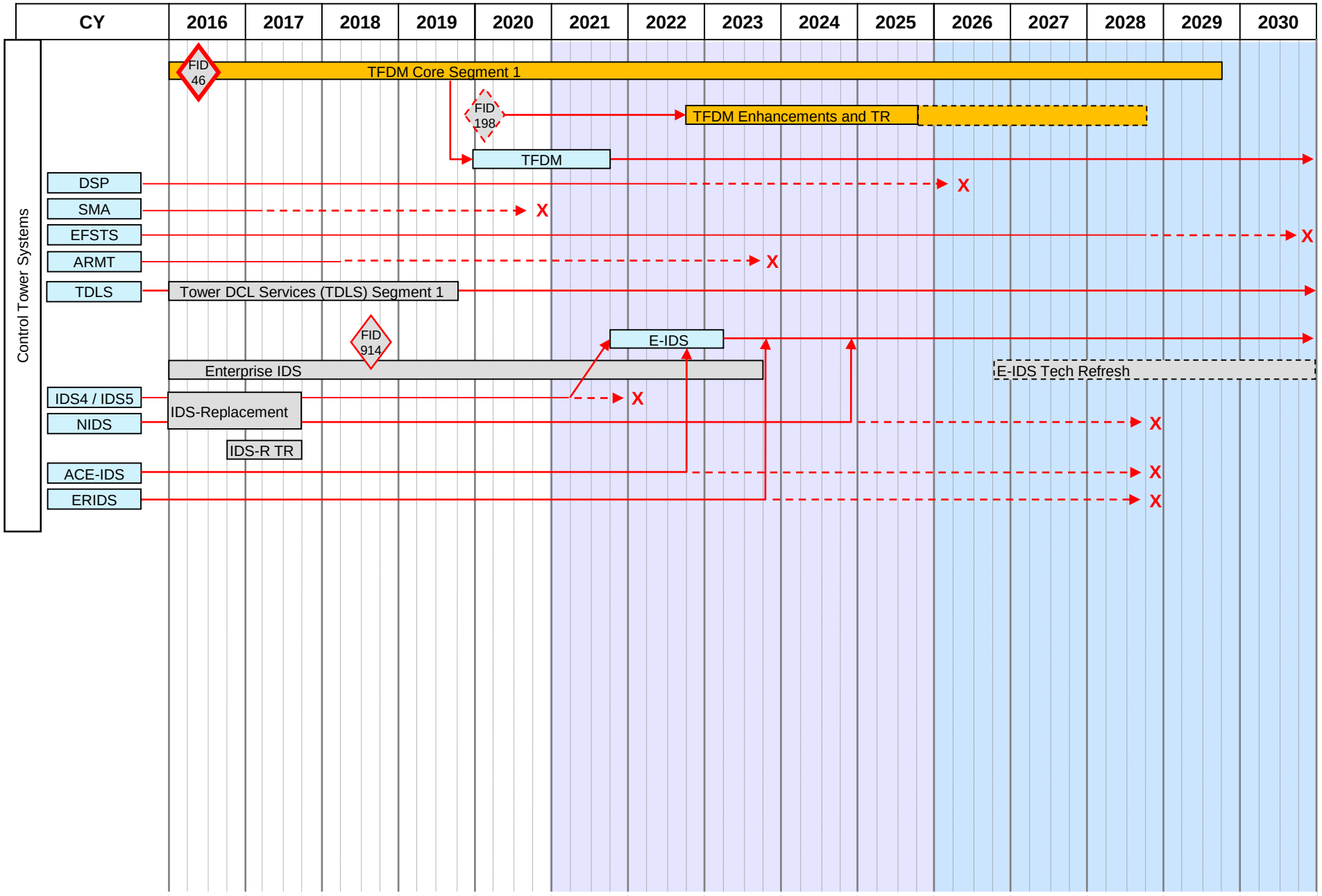
Airport Roadmap (3 of 3)



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Airport Roadmap: Assumptions

Identifier	Description
APT-01	This roadmap will focus on airport airside and landside activities (not including inside the airport terminal), and arrival/departure operations out to about 5 miles.
APT-02	Airports are covered in general; specific airports are not described.
APT-03	Initial work covers large/medium hub airports.
APT-04	Key decisions are pulled from other roadmaps.
APT-05	This is an initial roadmap that connects FAA infrastructure elements to airport airside infrastructure elements, and provides a basis for future tracking of the boundary and boundary issues.
APT-06	Runway extensions and new runways will affect the FAA's F & E cost
APT-07	There are Non-Fed NAVAIDS and facilities located at some airports that will affect the FAA's F & E cost.

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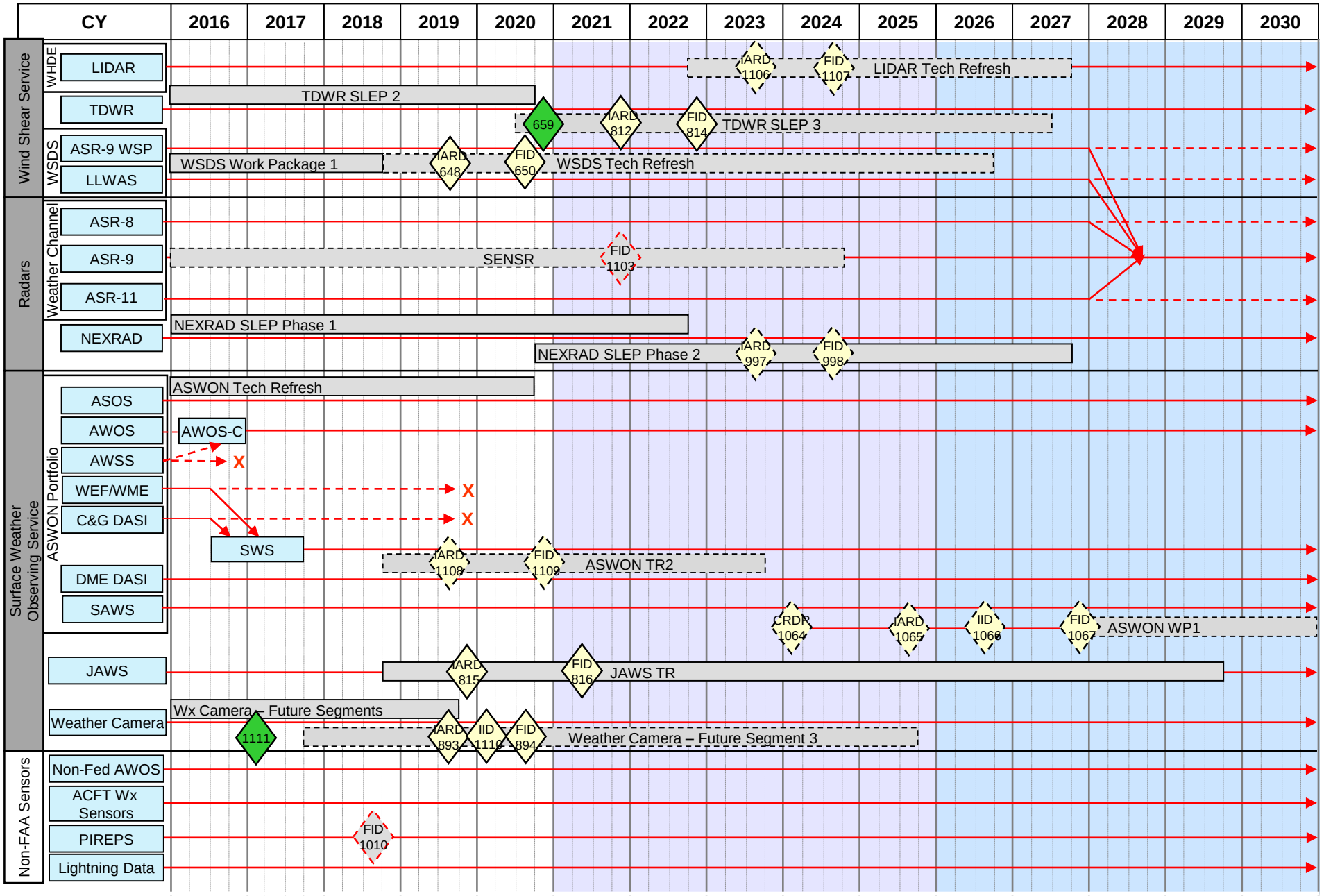
Airport Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
46	2016 Q2	Yes	Automation	FID	Final Investment Decision (FID) for Terminal Flight Data Manager (TFDM) Segment 1
74	2020 Q3	Yes	Communication	FID	Final Investment Decision (FID) for FTI-2
76	2019 Q2	No	Surveillance	FID	Final Investment Decision (FID) for ASDE-3 Service Sustainment
198	2020 Q1	Yes	Automation	FID	Final Investment Decision (FID) for TFDM Segment 2
220	2026 Q4	No	Navigation	Strategy (Other)	Decision to Cut Over to Dual Frequency / Multi-Constellation Operations Based on Completion of Dual Frequency (GPS L1 and L5) Development & Testing.
235	2016 Q3	No	Navigation	Strategy (JRC)	Strategy Decision on Rationalization of CAT I ILSs Operating in the NAS
259	2019 Q1	No	Surveillance	FID	Final Investment Decision (FID) for RWSL Technology Refresh
650	2020 Q3	No	Weather	FID	Final Investment Decision (FID) for WSDS Tech Refresh
772	2018 Q1	No	Airspace & Procedures	Policy	Decision to Incorporate Wake Re-Categorization (Phase 2) into Air Traffic Control Orders
773	2020 Q1	No	Airspace & Procedures	Policy	Decision to Incorporate Wake Re-Categorization (Phase 3) into Air Traffic Control Orders
914	2018 Q3	Yes	Automation	FID	Final Investment Decision (FID) for Enterprise Information Display System (E-IDS)
1067	2027 Q4	No	Weather	FID	Final Investment Decision (FID) for ASWON Work Package 1
1109	2020 Q4	No	Weather	FID	Final Investment Decision (FID) for ASWON Tech Refresh 2

Weather

Objective: The Weather Roadmap presents an Executive View (EV) of weather-related acquisition activities and the changes to these activities that exist within the Weather enterprise architecture (EA) domain (projects and programs) of the Federal Aviation Administration (FAA). The Weather Roadmap provides the evolution of the weather architecture via AMS milestones and related activities (e.g., aviation weather research, demonstrations, and other agency activities) necessary to achieve the performance objectives and capabilities to support NextGen. As a perspective of the changes in the NAS operational environment, the Weather Roadmap reflects major Weather interdependencies to support (or be supported by) other domains in the NAS enterprise architecture as depicted in NAS Roadmaps.

Weather Roadmap (1 of 4)



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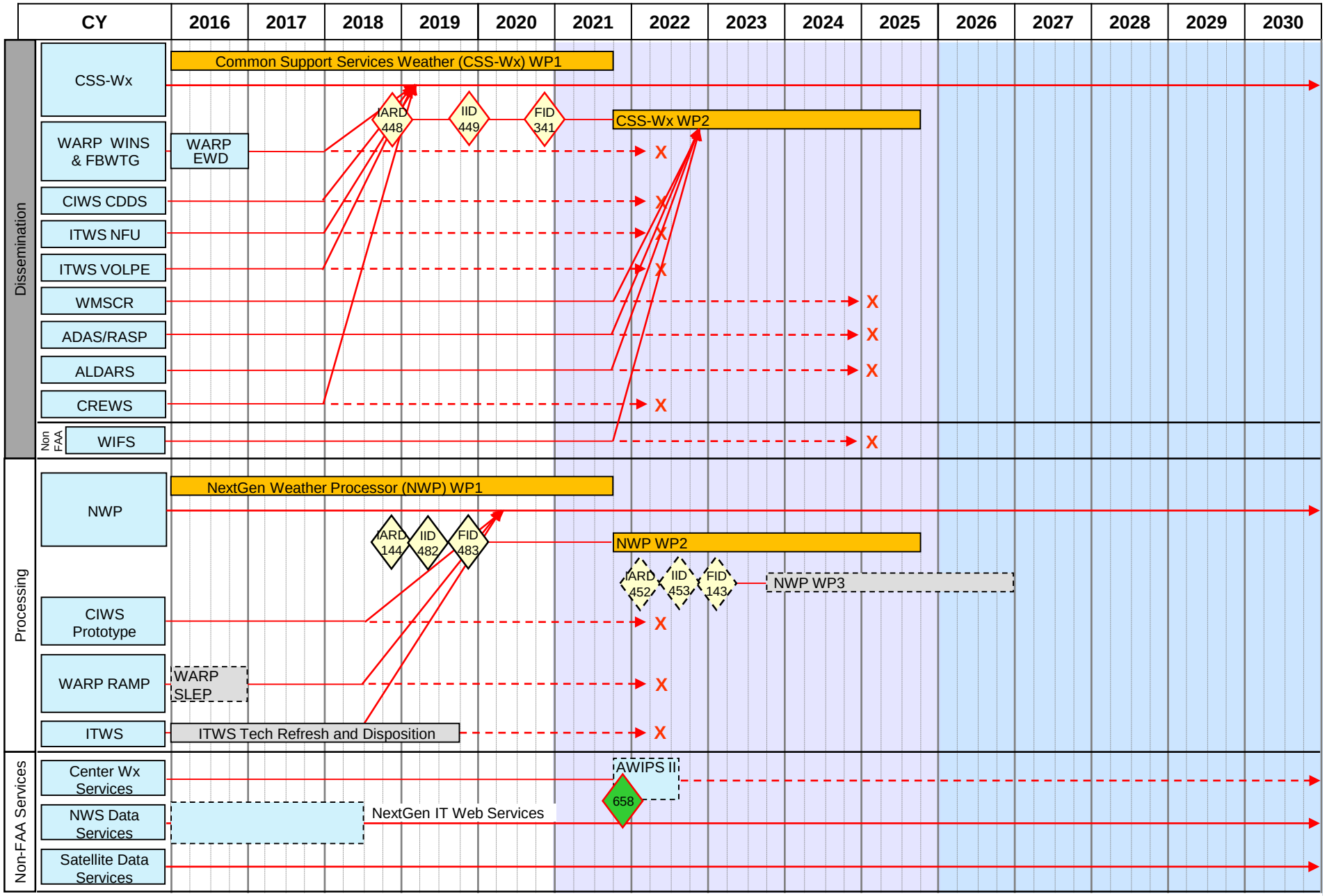
Weather Roadmap (2 of 4)



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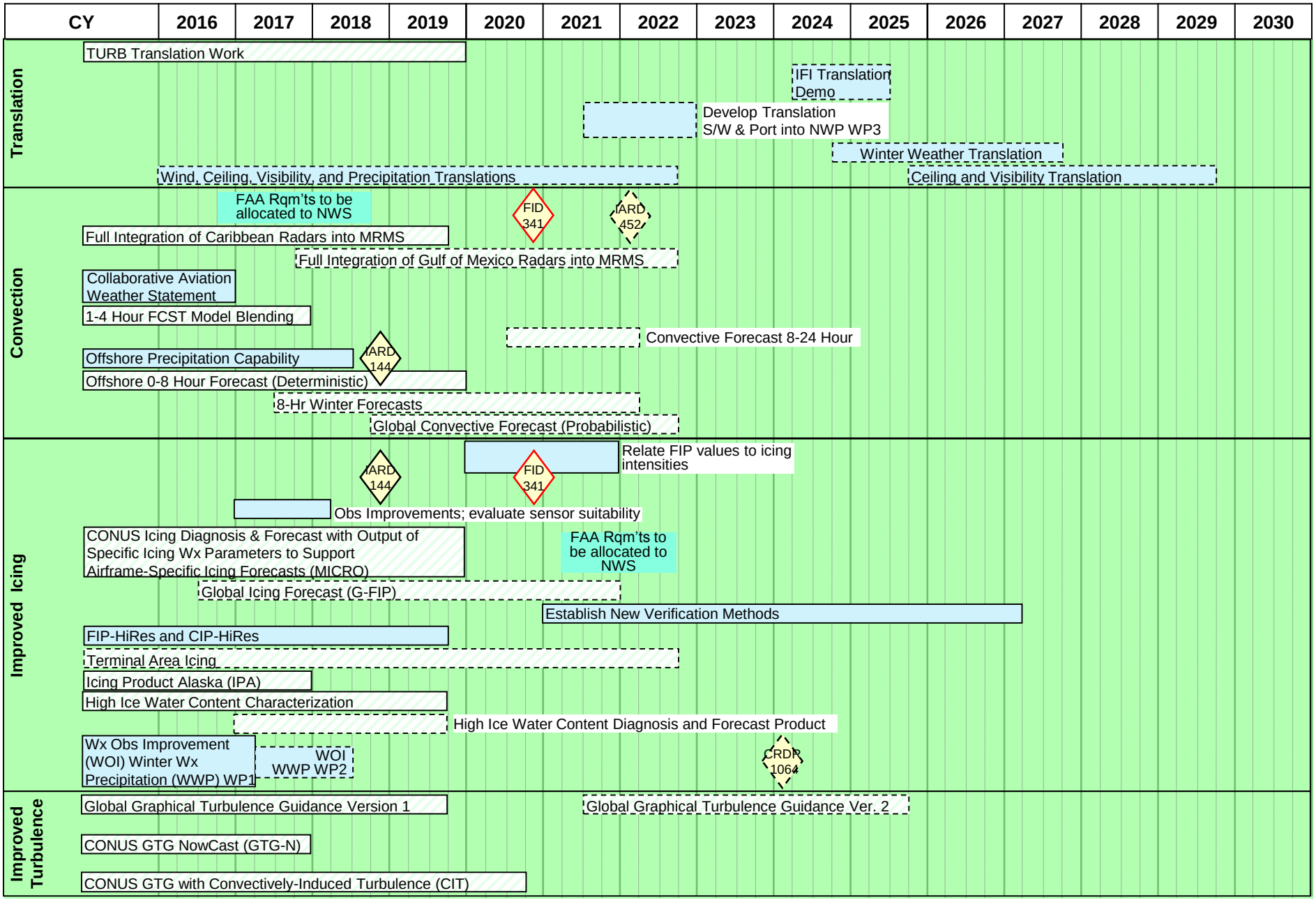
Weather Roadmap (3 of 4)



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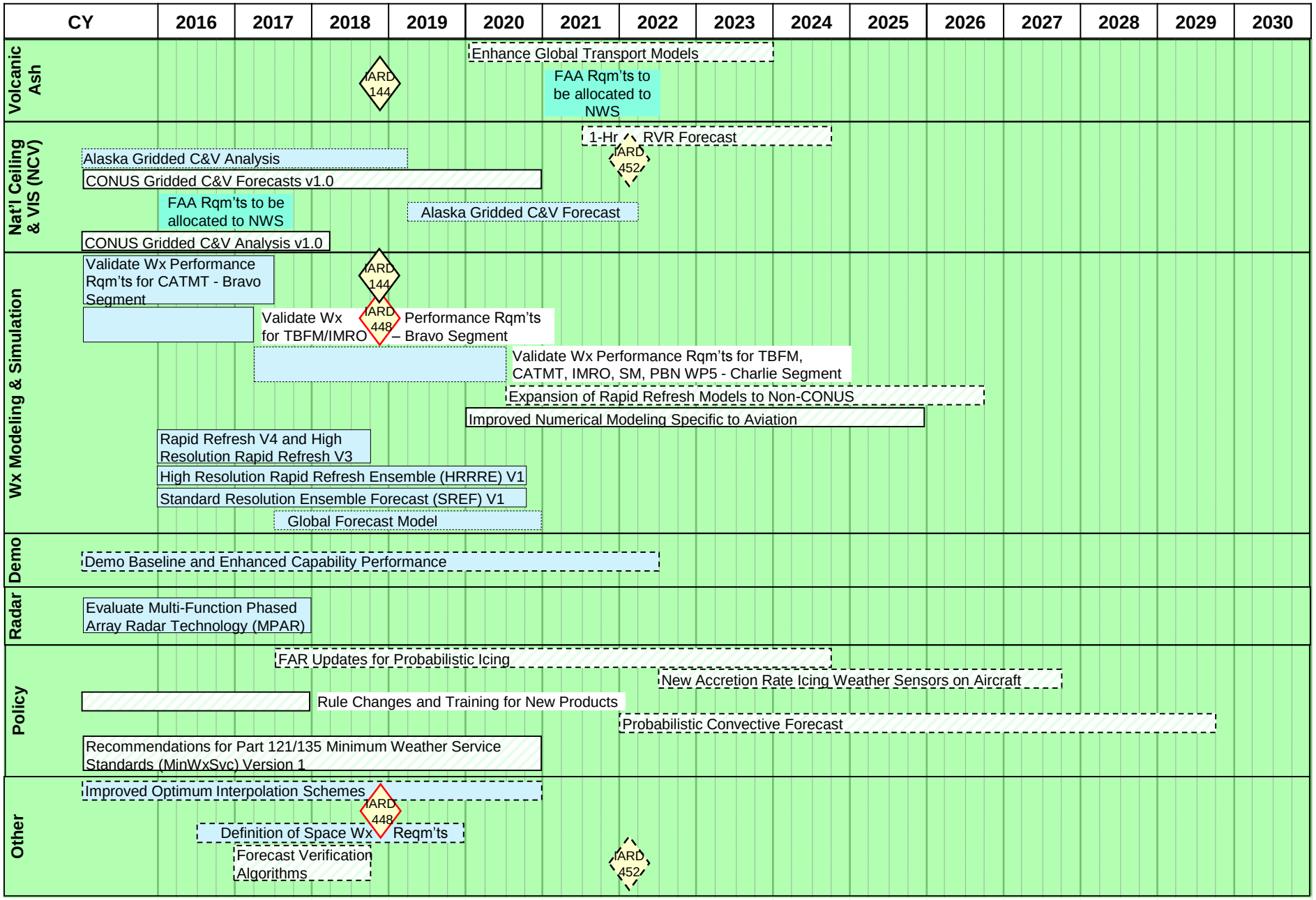
Weather Roadmap (4 of 4)



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Weather Roadmap: Assumptions (1 of 3)

Identifier	Description
WX-01	Ongoing NextGen (NG) Weather functional & performance requirements validation may result in new/emerging requirements in NextGen Weather Architecture.
WX-02	Terminal Weather Sensor Sustainment: - Terminal Weather Sensors divide into four functional divisions, A) weather radars, B) wind shear detection systems, C) automated surface weather observing systems, and D) other. A) includes TDWR, which will require a future Service Life Extension Program (SLEP) 3 until NextGen replacements can be deployed, circa 2026 - 2035. B) Includes LLWAS-RS, LLWAS-NE++, and WSP hosted on ASR-9. A future WSDS Work Package 2 (WP2) will address obsolescence issues. WSP may be replaced under some alternatives of NextGen Surveillance and Weather Radar Capability (NSWRC). C) includes the ASWON Portfolio which is being standardized into three systems, (ASOS / AWOS-C / SWS) and replaces old AWOS, AWSS, SAWS, WEF, and DASI systems. D) includes both JAWS (turbulence detection) and WHDE/LIDAR (Dry Microburst detection) systems that exist at single airports as unique systems. LIDAR is to be O&M funded.
WX-03	1) ADAS-Rehost serves as a consolidating access point for Weather observations for CSS-Wx Work Package 2 (WP2). 2) WMSCR communications functionality and ADAS RASP, including ALDARS functionality, as well as WIFS, to be subsumed by CSS-Wx WP2.
WX-04	Weather information distribution from NWS will be migrated to the enterprise network-enabled capability 'NOAA NextGen IT Web Services.' The FAA has provided requirements to NWS for the NOAA NextGen IT Web Services.
WX-05	NAS Infrastructure Portfolio supports application of R&D results (new weather products) to NAS users with minimal architectural or infrastructure change. R&D must be prioritized to enable NextGen capabilities to have ample funding for Weather, and to increase focus on "translation" in order to realize the NextGen goals. Weather sensor and forecast accuracy and frequency may need to be increased to meet far-term NextGen Performance Requirements. Weather R&D must coordinate with NWS efforts and with ICAO to harmonize with NextGen/SESAR weather requirements.

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Weather Roadmap: Assumptions (2 of 3)

Identifier	Description
WX-06	Weather processing functions converge into NextGen Weather Processor (NWP). NWP will be implemented in several Work Packages. NWP Work Package 1 (WP1) provides both NWP-Terminal and NWP-Central services. NWP Work Package 1 replaces prototype CIWS functions including 0-2 hour weather capability and 2-8 hour convective (CoSPA) capability. The Weather and Radar Processor (WARP) Radar Acquisition and Mosaic Processor (RAMP) function is subsumed by NWP WP1. ITWS is also subsumed by NWP WP1. NWP Work Package 2 hosts Wx R&D algorithms matured since WP1 baseline freeze including improved convective and translation algorithms. NWP WP3 will implement NextGen weather far-term capabilities.
WX-07	Weather Publishing/Communications functionality to be provided by Common Support Service Weather (CSS-Wx WP1/WP2).
WX-08	Strategy DP 658 addresses the discontinuance of the Center Weather Service Unit (CWSU) support as advanced DSTs are fielded (approximately FY 2022), or if CWSU contract is maintained, FAA and National Weather Service will determine who will provide the meteorological workstation functionality.
WX-09	NAS Infrastructure Portfolio will supply weather information to users at user-specified resolution, both spatially and temporally. NextGen Weather Processor (NWP) WP1 will host the first NextGen mid-term "weather translation" product, e.g., Weather Avoidance Fields (WAF) convective weather constraints to aircraft movement in NAS airspace, which will be delivered by CSS-Wx WP1. WAFs may be machine-translated into NAS operational impacts by User DSTs.
WX-10	Products developed from requirements allocated to NWS, will be accessible via CSS-Wx WP1/WP2 as they become operational.
WX-11	Rain/Freezing Rain/Freezing Drizzle discrimination sensor essential to mitigate automated surface observing shortfalls at Level A/B airports to support Aircraft and Airport Ground Anti/De-icing operations. FAA will continue to evaluate maturity of R&D to support NextGen capacity/safety goals.

Weather Roadmap: Assumptions (3 of 3)

Identifier	Description
WX-12	Weather observation/forecast R&D will continue to be periodically evaluated to determine whether new/improved functionality should be implemented.
WX-13	FAA will transmit validated Weather Forecast Performance Requirements to NWS within six months of end date of associated supporting activity.
WX-14	Replacement of WSP hinges on approval of the FAA Spectrum Pipeline Plan submitted to OMB for approval by December 2016. Approval means the NextGen Surveillance and Weather Capability (NSWRC) will be subsumed by the Spectrum Efficient National Surveillance Radar (SENSR) Program funded by OMB through Spectrum Relocation Funds outside the CIP. A multi-agency program, SENSR control is held by DOT above the FAA JRC, but will essentially meet AMS milestones of IARD in 2018 and FID in 2021. NSWRC (at IARD) would resume in 2017 in the event SENSR is not approved. SENSR addresses outside requirements of partner Federal Agencies, well beyond weather alone.
WX-15	New sensor(s) that adds capability to automatically detect ice pellets and drizzle. Resultant sensor integrated at all ASOS Service Level locations reports rain, snow, ice pellets and drizzle (and integrates with ASOS freezing rain sensor to report freezing drizzle and freezing rain). This capability will meet all FAA ASOS automated sensor requirements (except hail, small hail, and snow grains), is fundamental to emerging anti-icing regulations, and will be implemented in Phase 1 of the ASWON TR2.

Weather Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
143	2023 Q1	No	Weather	FID	Final Investment Decision (FID) for NWP WP3
144	2018 Q4	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for NWP WP2
341	2020 Q4	Yes	Weather	FID	Final Investment Decision (FID) for CSS-Wx WP2 and transition of ADAS communications (and WMSCR Comms if not completed in CSS-Wx) to CSS-Wx WP2
448	2018 Q4	Yes	Weather	IARD	Investment Analysis Readiness Decision (IARD) for CSS-Wx WP2 and transition of ADAS and WMSCR Comms to CSS-Wx
449	2019 Q4	Yes	Weather	IID	Initial Investment Decision (IID) for CSS-Wx WP2 and transition of ADAS communications (and WMSCR Comms if not completed in CSS-Wx) to CSS-Wx WP2
452	2022 Q1	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for NWP WP3
453	2022 Q3	No	Weather	IID	Initial Investment Decision (IID) for NWP WP3
482	2019 Q2	No	Weather	IID	Initial Investment Decision (IID) for NWP WP2
483	2019 Q4	No	Weather	FID	Final Investment Decision (FID) for NWP WP2
648	2019 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for WSDS Tech Refresh
650	2020 Q3	No	Weather	FID	Final Investment Decision (FID) for WSDS Tech Refresh
658	2021 Q4	Yes	Weather	Strategy (JRC)	Strategy Decision to determine if Automation/DSTs can provide sufficient weather support services
659	2020 Q4	No	Weather	Strategy (JRC)	Strategy Decision for SLEP 3 on TDWR
812	2021 Q4	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for TDWR SLEP 3
814	2022 Q4	No	Weather	FID	Final Investment Decision (FID) for TDWR SLEP 3
815	2019 Q4	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for JAWS TR
816	2021 Q2	No	Weather	FID	Final Investment Decision (FID) for JAWS TR
893	2019 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for Weather Camera - Future Segment 3
894	2020 Q3	No	Weather	FID	Final Investment Decision (FID) for Weather Camera - Future Segment 3

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Weather Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
997	2023 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for NEXRAD SLEP Phase 2
998	2024 Q3	No	Weather	FID	Final Investment Decision (FID) for NEXRAD SLEP Phase 2
1010	2018 Q3	Yes	Automation	FID	Final Investment Decision (FID) for ERAM Tech Refresh 3
1064	2024 Q1	No	Weather	CRDR	Concept and Requirements Definition Readiness (CRDR) Decision for ASWON Work Package 1
1065	2025 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for ASWON Work Package 1
1066	2026 Q3	No	Weather	IID	Initial Investment Decision (IID) for ASWON Work Package 1
1067	2027 Q4	No	Weather	FID	Final Investment Decision (FID) for ASWON Work Package 1
1103	2021 Q4	Yes	Surveillance	FID	Final Investment Decision (FID) for SENSR
1106	2023 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for LIDAR Tech Refresh
1107	2024 Q3	No	Weather	FID	Final Investment Decision (FID) for LIDAR Tech Refresh
1108	2019 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for ASWON Tech Refresh 2
1109	2020 Q4	No	Weather	FID	Final Investment Decision (FID) for ASWON Tech Refresh 2
1110	2020 Q1	No	Weather	IID	Initial Investment Decision (IID) for Weather Cameras - Future Segment 3
1111	2017 Q1	No	Weather	Strategy (JRC)	Strategy Decision for Weather Camera - Future Segments

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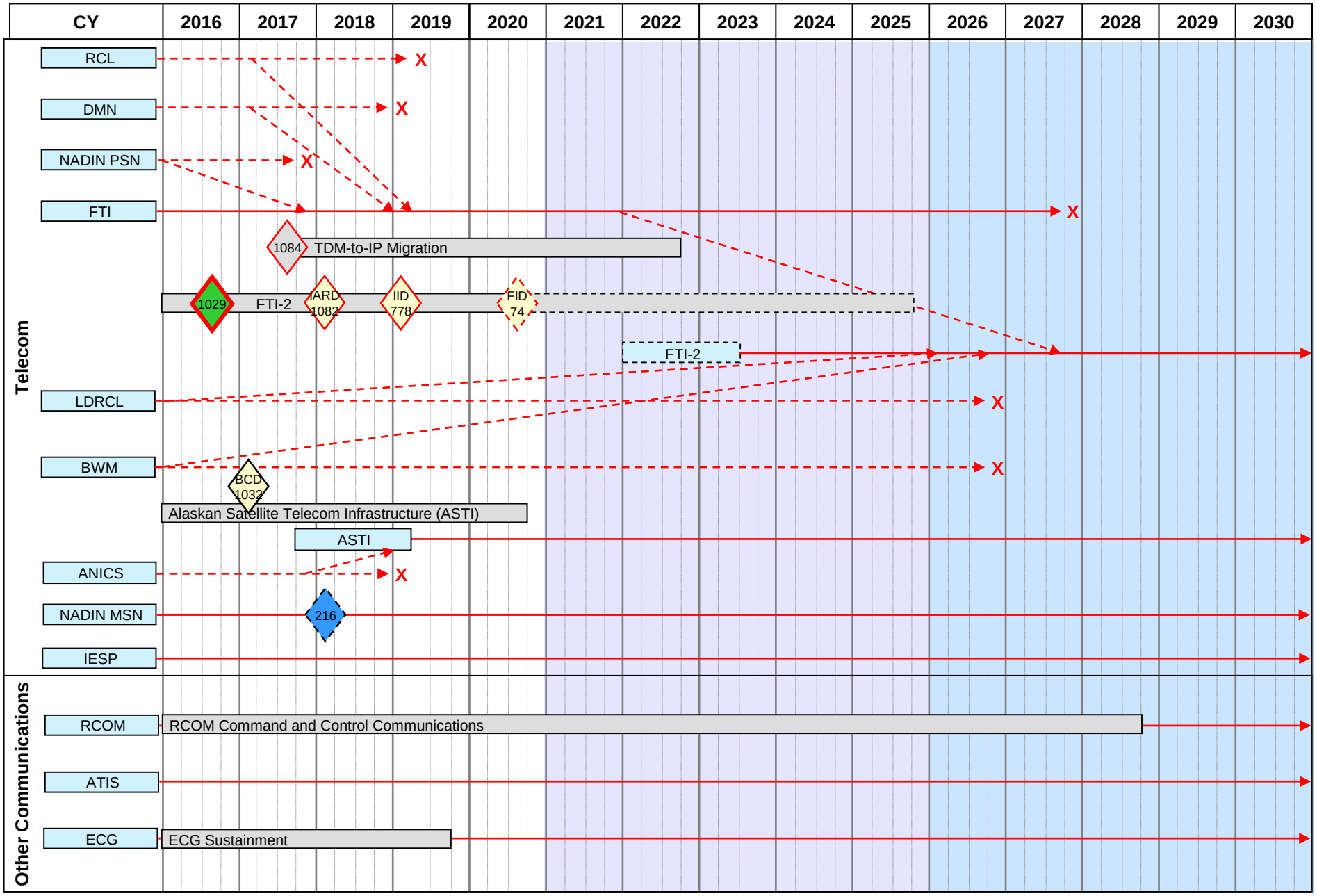
Communication

Objective : The Communication Roadmap presents an Executive View (EV) of the current communication systems supporting the National Airspace System and their enhancement, sustainment or replacement through major development programs and support activities. The Communication Roadmap is intended to convey the major communication program strategy and acquisition decision points as well as program funding. The roadmap serves as a summary view of more detailed plans within each development program.

Communications Roadmap (1 of 5)



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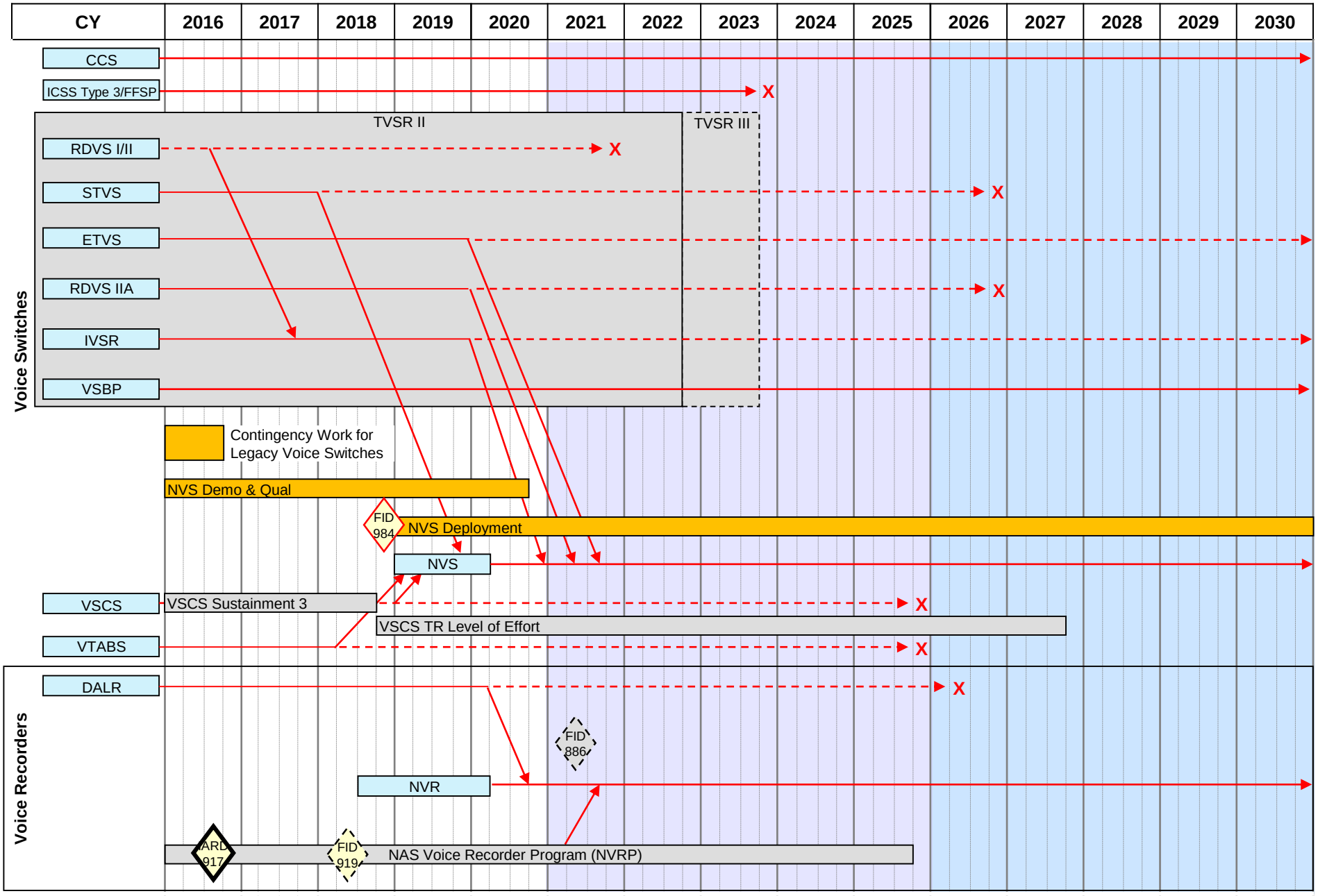
Communications Roadmap (2 of 5)



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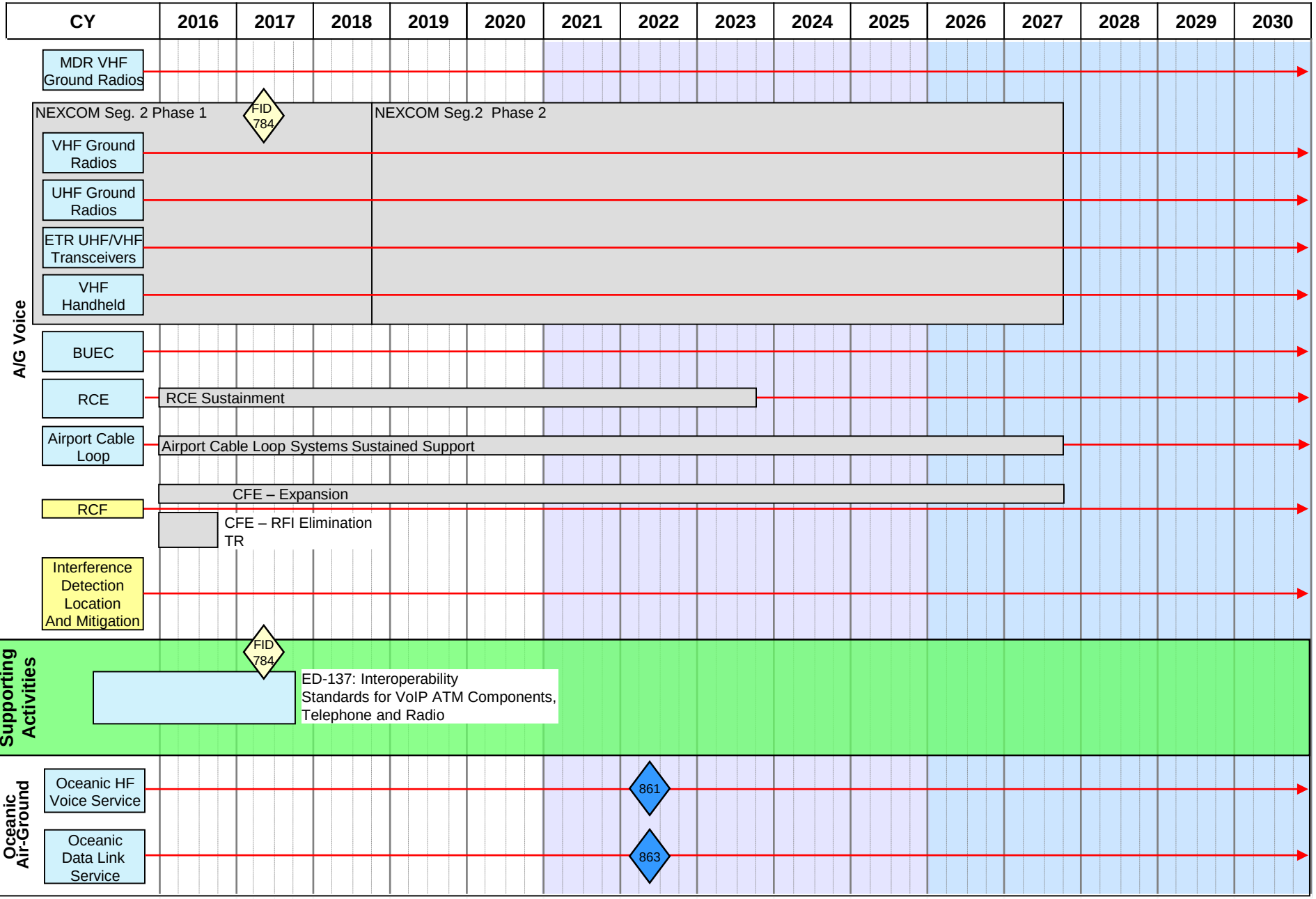
Communications Roadmap (3 of 5)



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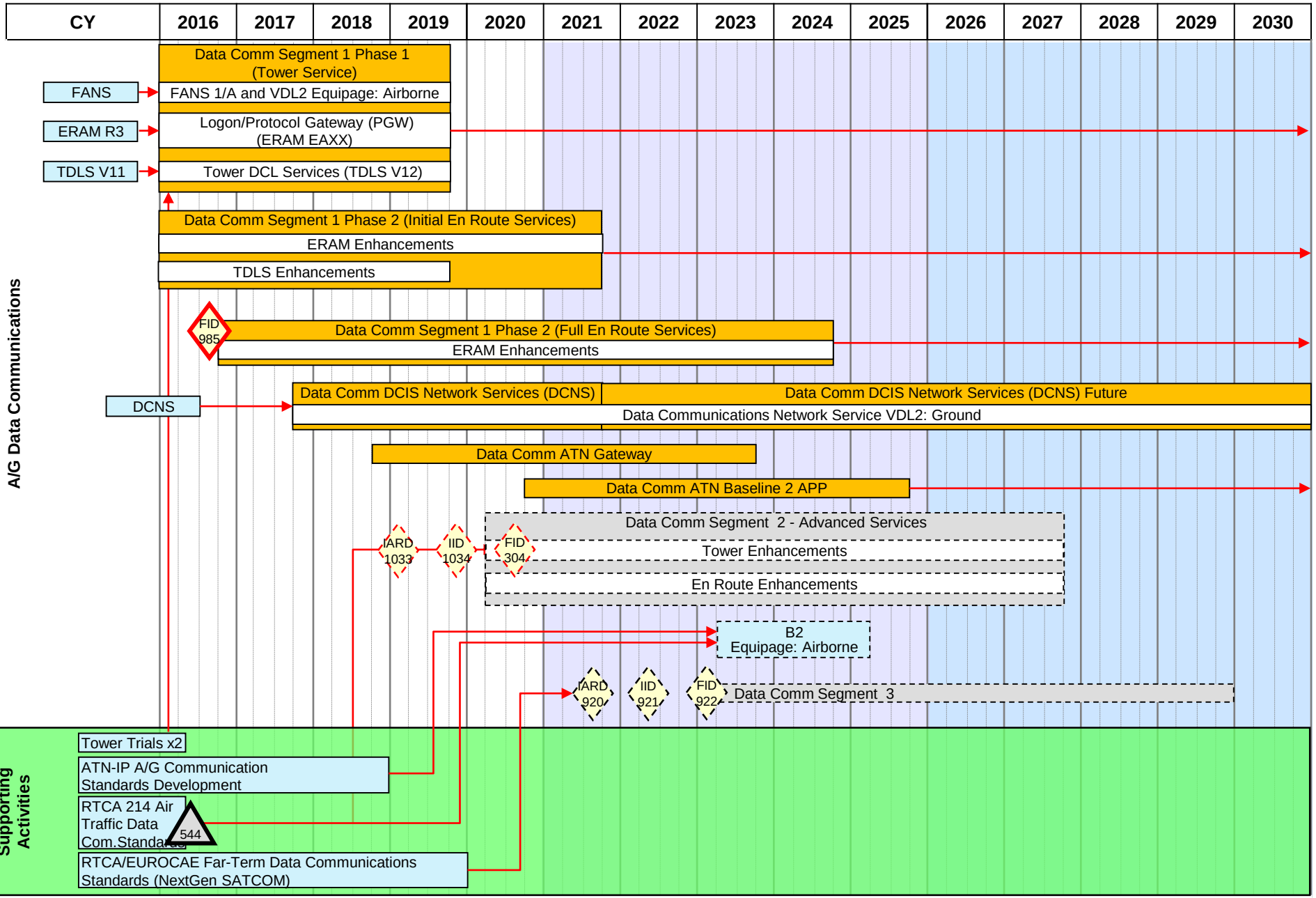
Communications Roadmap (4 of 5)



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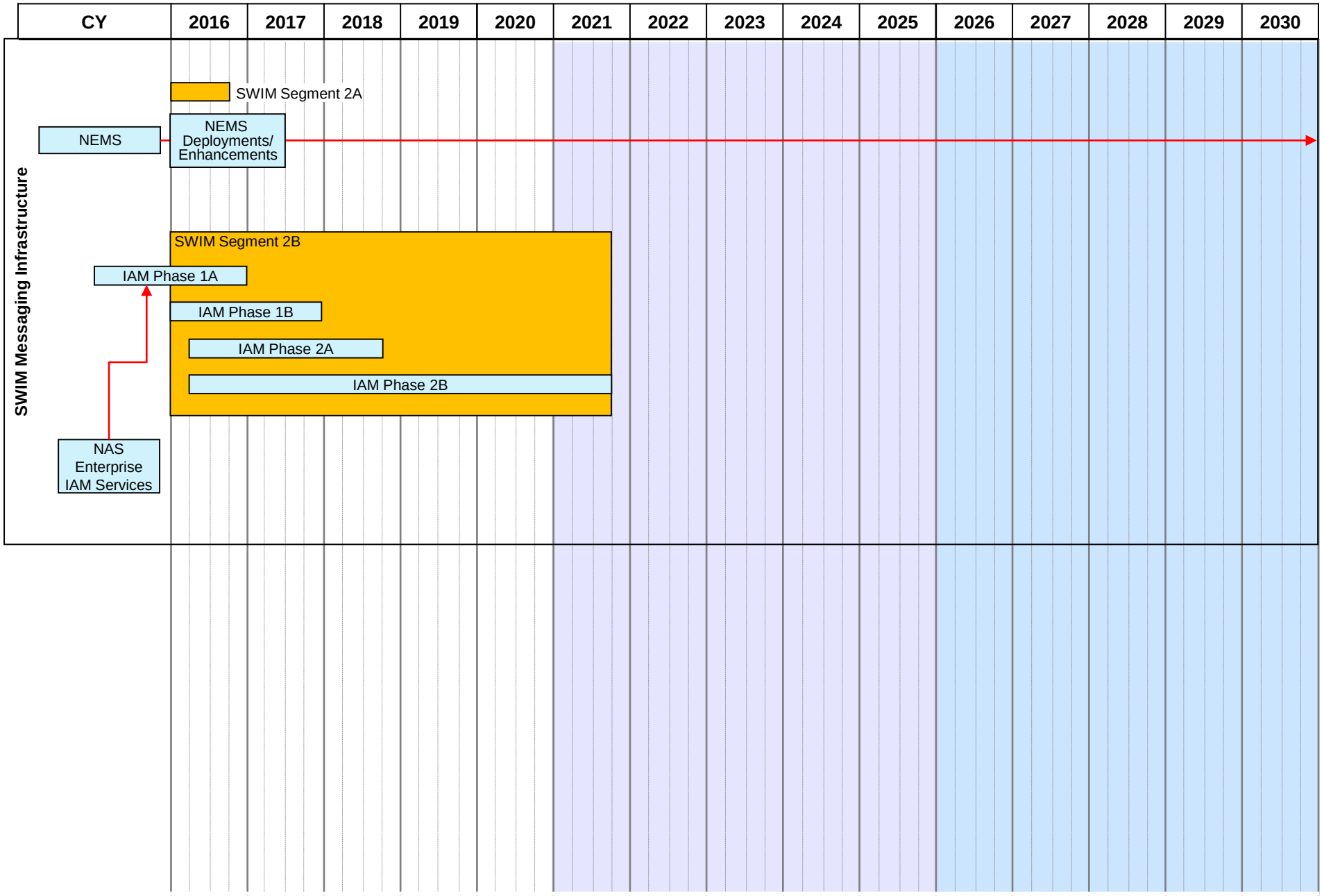
Communications Roadmap (5 of 5)



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Communications Roadmap: Assumptions (1 of 1)

Identifier	Description
COMM-01	FTI will become the primary ground-based Voice/Data transport system.
COMM-02	All domestic flight safety critical A/G communications are over VHF based systems. Advisory communications (e.g. Weather, NAS Status, NOTAMS) can be supported by VHF A/G Communication or by commercial communications services through airborne access to SWIM services.
COMM-03	There is an approved transition plan for migrating real-time surveillance data directly onto FTI services in order to allow DMN decommissioning. Plan on hold awaiting SIM decision.
COMM-04	Relationship between SWIM and Communications: SWIM Dataflows all leverage NAS OPS IP service and initial SWIM Segment 2 infrastructure is being implemented with FTI.
COMM-05	NVS is expected to be the end state solution for replacing the Type III ICSS as program requirements discussions for flight services are on-going.
COMM-06	ASTI (ANICS) will not be integrated into FAA Telecommunications Infrastructure contract.
COMM-07	FIDI TR will develop IP communication protocols between automation systems (e.g. ERAM, terminal clients) which end systems will provide the investment necessary to implement required changes.
COMM-08	DataComm Segment 2 will likely move directly to FID (expected IARD and IID to be waived by JRC). JRC approved a joint IID for Segment 1 and 2 in 2008.

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Communications Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
74	2020 Q3	Yes	Communication	FID	Final Investment Decision (FID) for FTI-2
216	2018 Q1	No	Communication	Strategy (Other)	Strategy Decision to determine to sustain or replace NMR
304	2020 Q3	Yes	Communication	FID	Final Investment Decision (FID) for Data Comm Segment 2
544	2016 Q2	No	Aircraft	Regulatory Milestone	Publication of Guidance Under SC-214 for Avionics
778	2019 Q1	Yes	Communication	IID	Initial Investment Decision (IID) for FTI-2
784	2017 Q2	No	Communication	FID	Final Investment Decision (FID) for NEXCOM Segment 2 Phase 2 in remaining Terminal and Flight Service areas
861	2022 Q2	No	Communication	Strategy (Other)	Strategy decision to determine need for continuation of Oceanic HF Voice Services
863	2022 Q2	No	Communication	Strategy (Other)	Strategy decision to determine need for continuation of Oceanic Data Link Services
886	2021 Q2	No	Safety	FID	Final Investment Decision (FID) for Operational Analysis and Reporting System (OARS) Phase 2
917	2016 Q3	No	Communication	IARD	Investment Analysis Readiness Decision (IARD) for NAS Voice Recorder Program (NVRP)
919	2018 Q2	No	Communication	FID	Final Investment Decision (FID) for NAS Voice Recorder Program (NVRP)
920	2021 Q3	No	Communication	IARD	Investment Analysis Readiness Decision (IARD) for DataComm Segment 3
921	2022 Q2	No	Communication	IID	Initial Investment Decision (IID) for DataComm Segment 3
922	2023 Q1	No	Communication	FID	Final Investment Decision (FID) for DataComm Segment 3
984	2018 Q4	Yes	Communication	FID	Final Investment Decision (FID) for NVS to Obtain Funding for Deployment Beyond Key Sites
985	2016 Q3	Yes	Communication	FID	Final Investment Decision (FID) for Data Communications Segment 1 Phase 2 En Route Services Full
1029	2016 Q3	Yes	Communication	Strategy (JRC)	Strategy Decision for FTI-2 Planning
1032	2017 Q1	No	Communication	BCD	Baseline Change Decision (BCD) for Alaska Satellite Telecom Infrastructure (ASTI)

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Communications Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1033	2019 Q1	Yes	Communication	IARD	Investment Analysis Readiness Decision (IARD) for DataComm Segment 2
1034	2019 Q4	Yes	Communication	IID	Initial Investment Decision (IID) for DataComm Segment 2
1082	2018 Q1	Yes	Communication	IARD	Investment Analysis Readiness Decision (IARD) for FTI-2
1084	2017 Q3	Yes	Enterprise Services	Strategy (JRC)	Strategy Decision for TDM-to-IP Migration

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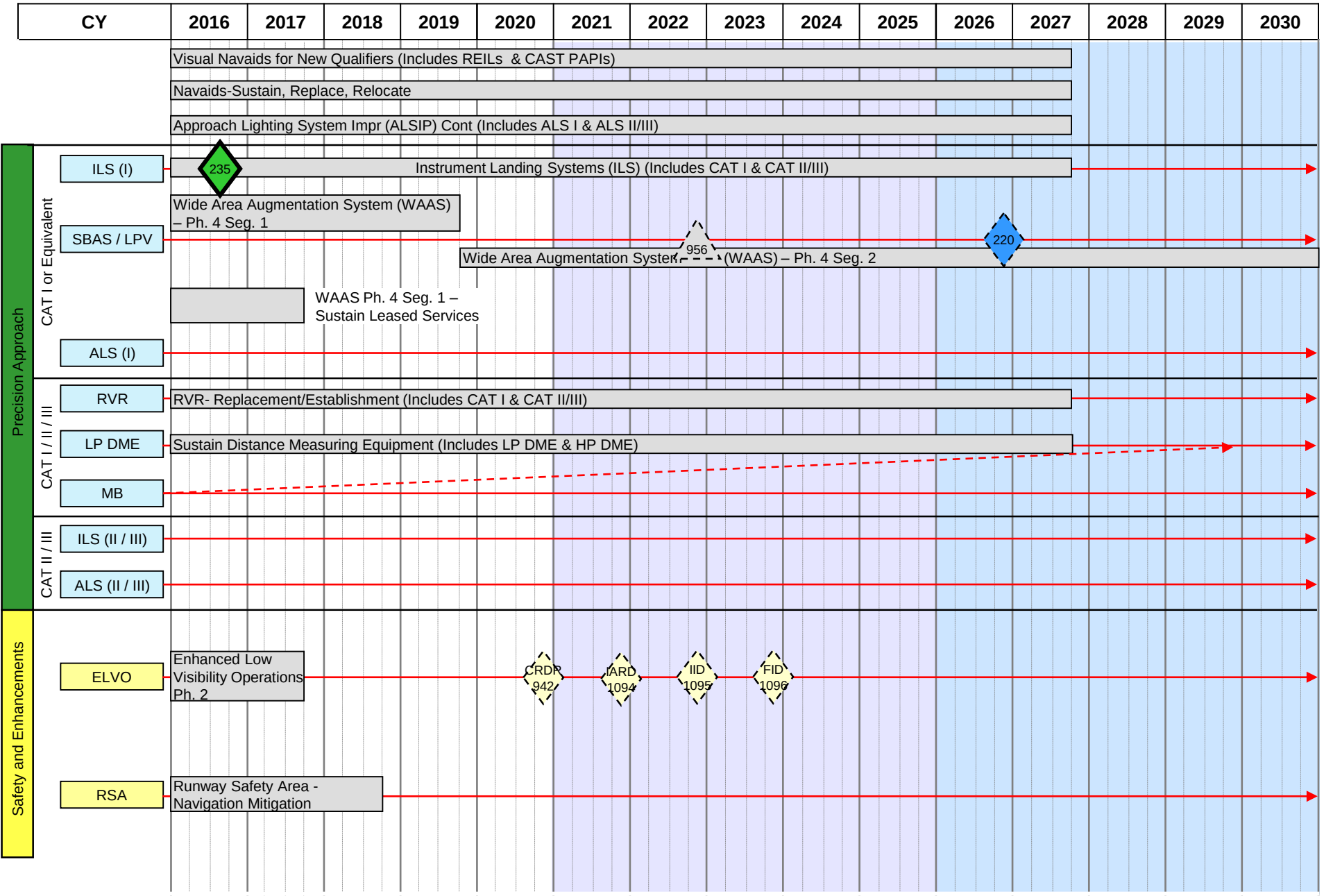
Navigation

Objective : The Navigation roadmap depicts the sustainment and evolution of ground-based and satellite-based navigation systems to support Performance-Based Navigation (PBN) in the NextGen environment

Navigation Roadmap (1 of 3)



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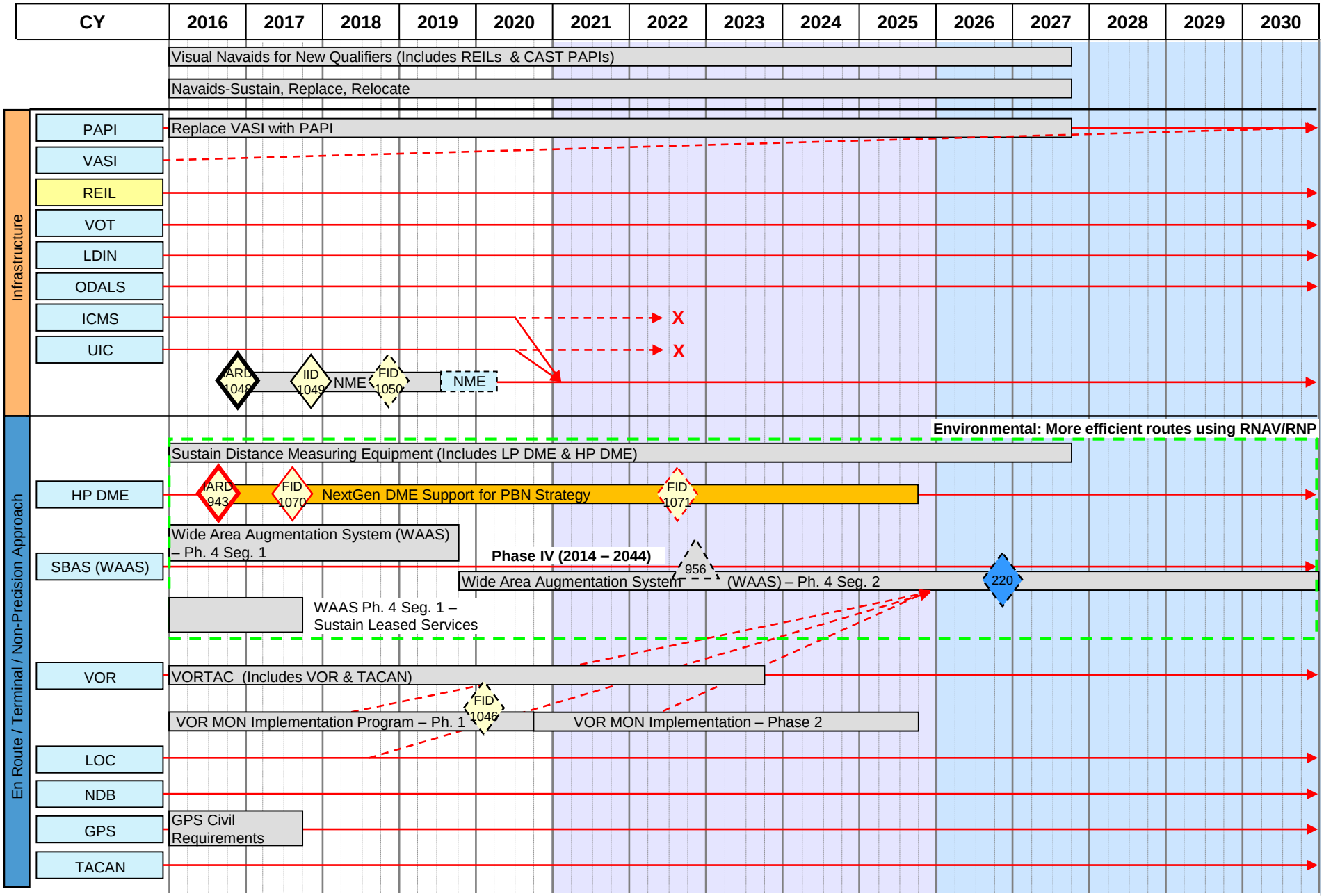
Navigation Roadmap (2 of 3)



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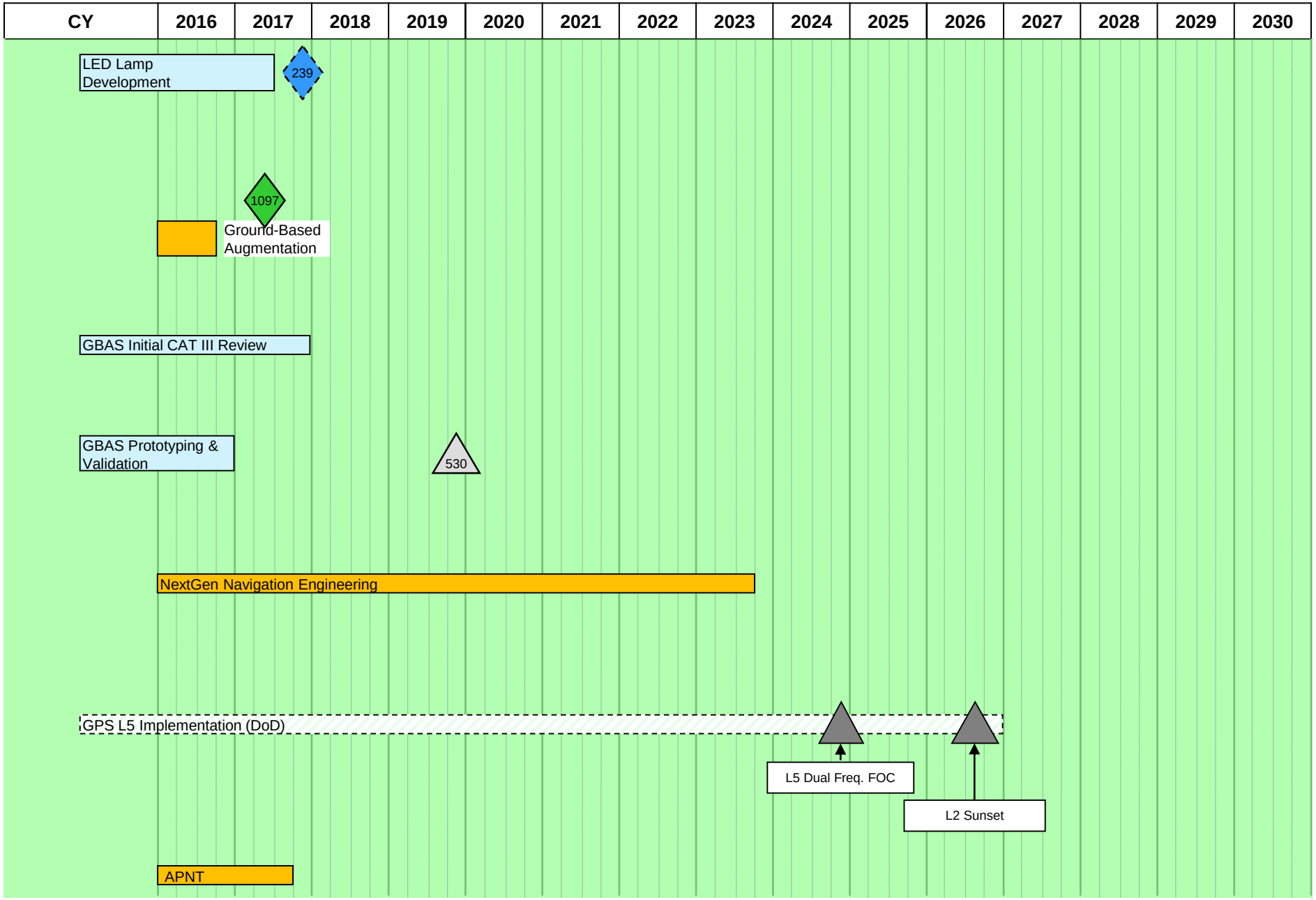
Navigation Roadmap (3 of 3)



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Navigation Roadmap: Assumptions (1 of 2)

Identifier	Description
NAV-01	FAA is transitioning to a PBN centric NAS, where PBN is used for daily operations. PBN is comprised of RNAV and RNP for en route, terminal, and approach & landing domains. This will include: a) Transition from VOR-defined routes to GNSS and DME-DME RNAV for en route and terminal. b) Transition from CAT I ILS to GNSS for approach and landing. c) Eliminate existing DME coverage gaps for en route and terminal domains to include no geographical critical DMEs.
NAV-02	NextGen implementation requires an aggressive transition to services that support Performance-Based Navigation (PBN). This requires: a) Navigation Strategy to be fully aligned with the FAA's PBN Strategy, which will provide: 1. A clear statement regarding the need and eligibility of navigation services for airports and airspace 2. Close collaboration with the aviation stakeholders
NAV-03	Need to continue working closely with users and the avionics industry on equipage issues to support transition to a PBN-centric NAS a) The PBN Strategy provides for PBN services that encourages voluntary equipage. b) Equipage will be in place to support transition to PBN
NAV-04	PBN strategy includes the need for a resilient navigation infrastructure to maintain safety, security, and capacity and preclude significant economic impact during GNSS outages. This includes: a) Maintaining a VOR MON to ensure en route and approach capabilities during GNSS disruptions for aircraft that are unable to continue RNAV operations. b) Sustain a sufficient number of ILSs to ensure safe landings in IMC during GNSS disruptions. c) En route and terminal DME RNAV coverage will support navigation to an ILS or VOR for aircraft not equipped with inertial capability.

Navigation Roadmap: Assumptions (2 of 2)

Identifier	Description
NAV-05	FAA has no current plan to acquire Federal GBAS systems. GBAS installations will depend on individual airports' interest and investment.
NAV-06	Department of Defense will maintain a GPS constellation consistent with the Standard Positioning Service.

Navigation Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
220	2026 Q4	No	Navigation	Strategy (Other)	Decision to Cut Over to Dual Frequency / Multi-Constellation Operations Based on Completion of Dual Frequency (GPS L1 and L5) Development & Testing.
235	2016 Q3	No	Navigation	Strategy (JRC)	Strategy Decision on Rationalization of CAT I ILSs Operating in the NAS
239	2017 Q4	No	Navigation	Strategy (Other)	Strategy Decision to Proceed with ALS (I) Production LED Lamps for MALSR Systems
530	2019 Q4	No	Aircraft	Regulatory Milestone	Publication of Updated MOPS for GBAS CAT III
942	2020 Q4	No	Navigation	CRDR	Concept and Requirements Definition Readiness (CRDR) to proceed to ELVO Phase III
943	2016 Q3	Yes	Navigation	IARD	Investment Analysis Readiness Decision (IARD) for NextGen DME Support for PBN
956	2022 Q4	No	Aircraft	Regulatory Milestone	Publication of SBAS Dual-Frequency/Multi-Constellation (DFMC) MOPS
1046	2020 Q1	No	Navigation	FID	Final Investment Decision (FID) for VOR MON Implementation - Phase 2
1048	2016 Q4	No	Navigation	IARD	Investment Analysis Readiness Decision (IARD) for Navigation Monitoring Equipment
1049	2017 Q4	No	Navigation	IID	Initial Investment Decision (IID) for Navigation Monitoring Equipment
1050	2018 Q4	No	Navigation	FID	Final Investment Decision (FID) for Navigation Monitoring Equipment
1070	2017 Q3	Yes	Navigation	FID	Final Investment Decision (FID) for NextGen DME Support for PBN Phase 1
1071	2022 Q3	Yes	Navigation	FID	Final Investment Decision (FID) for NextGen DME Support for PBN Phase 2
1094	2021 Q4	No	Navigation	IARD	Investment Analysis Readiness Decision (IARD) for ELVO Phase III
1095	2022 Q4	No	Navigation	IID	Initial Investment Decision (IID) for ELVO Phase III
1096	2023 Q4	No	Navigation	FID	Final Investment Decision (FID) for ELVO Phase III
1097	2017 Q2	No	Navigation	Strategy (JRC)	Strategy Decision for Ground-Based Augmentation System (GBAS)

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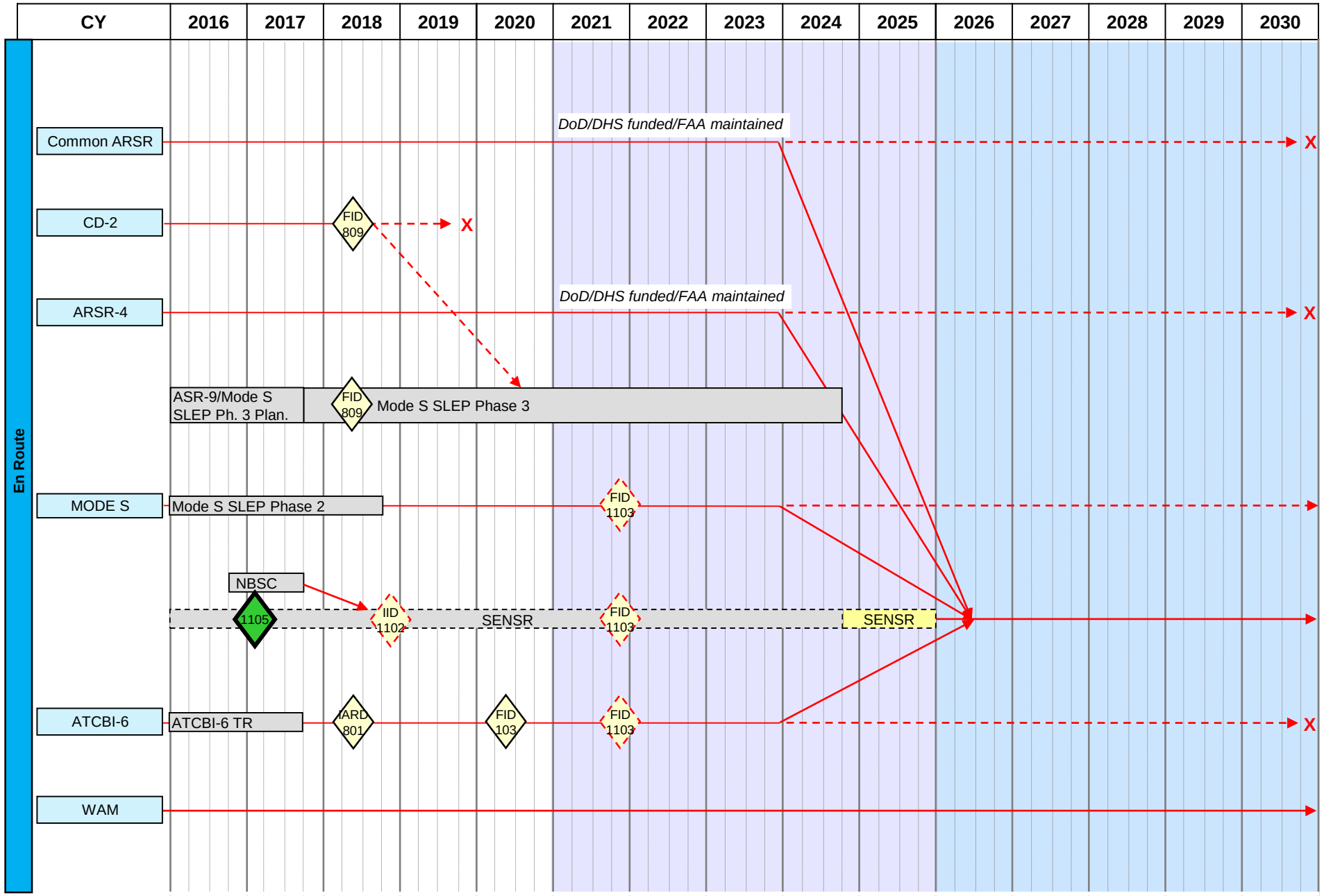
Surveillance

Objective : The Surveillance roadmap depicts the sustainment of legacy surveillance systems and the evolution towards the NextGen environment.

Surveillance Roadmap (1 of 4)



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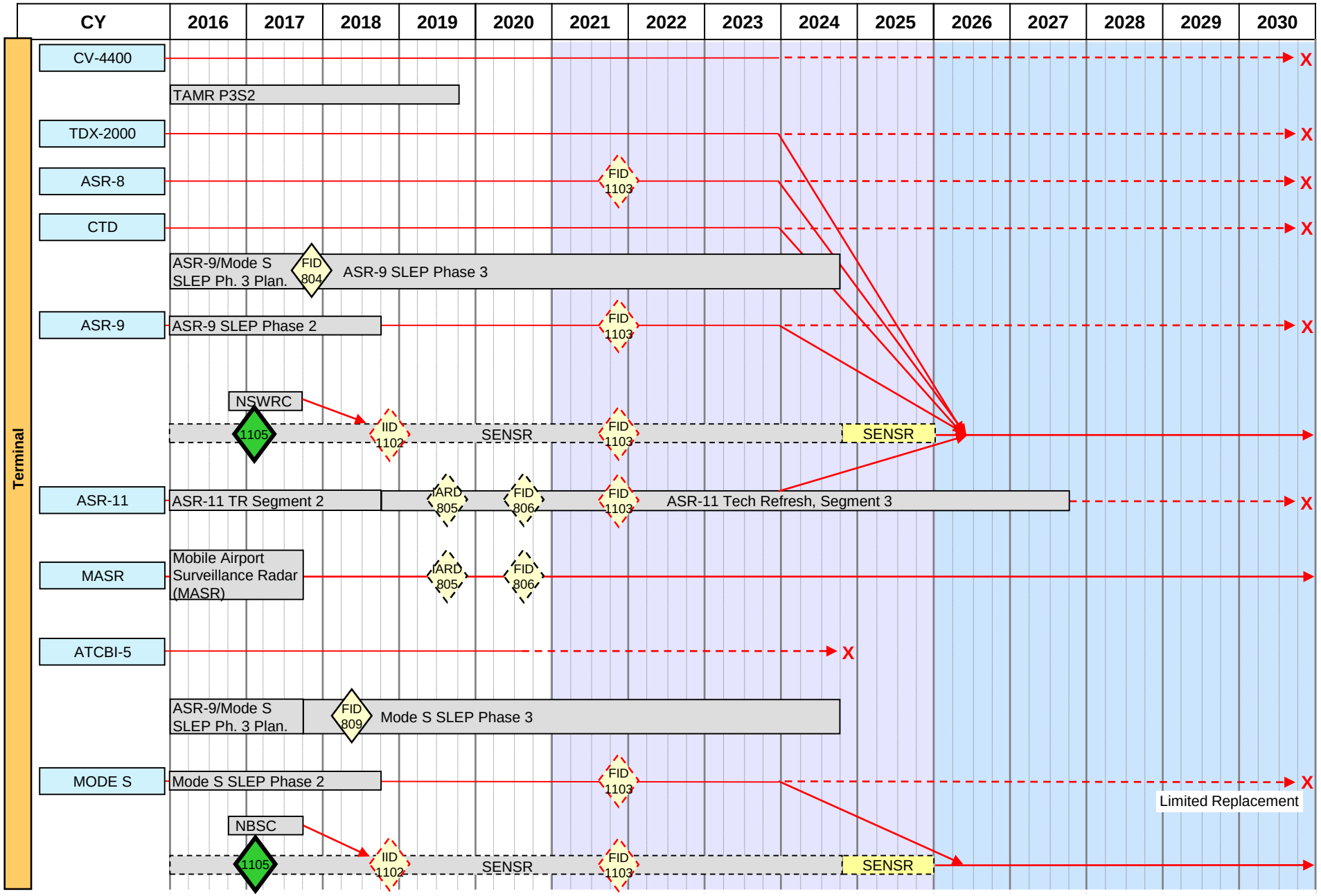
Surveillance Roadmap (2 of 4)



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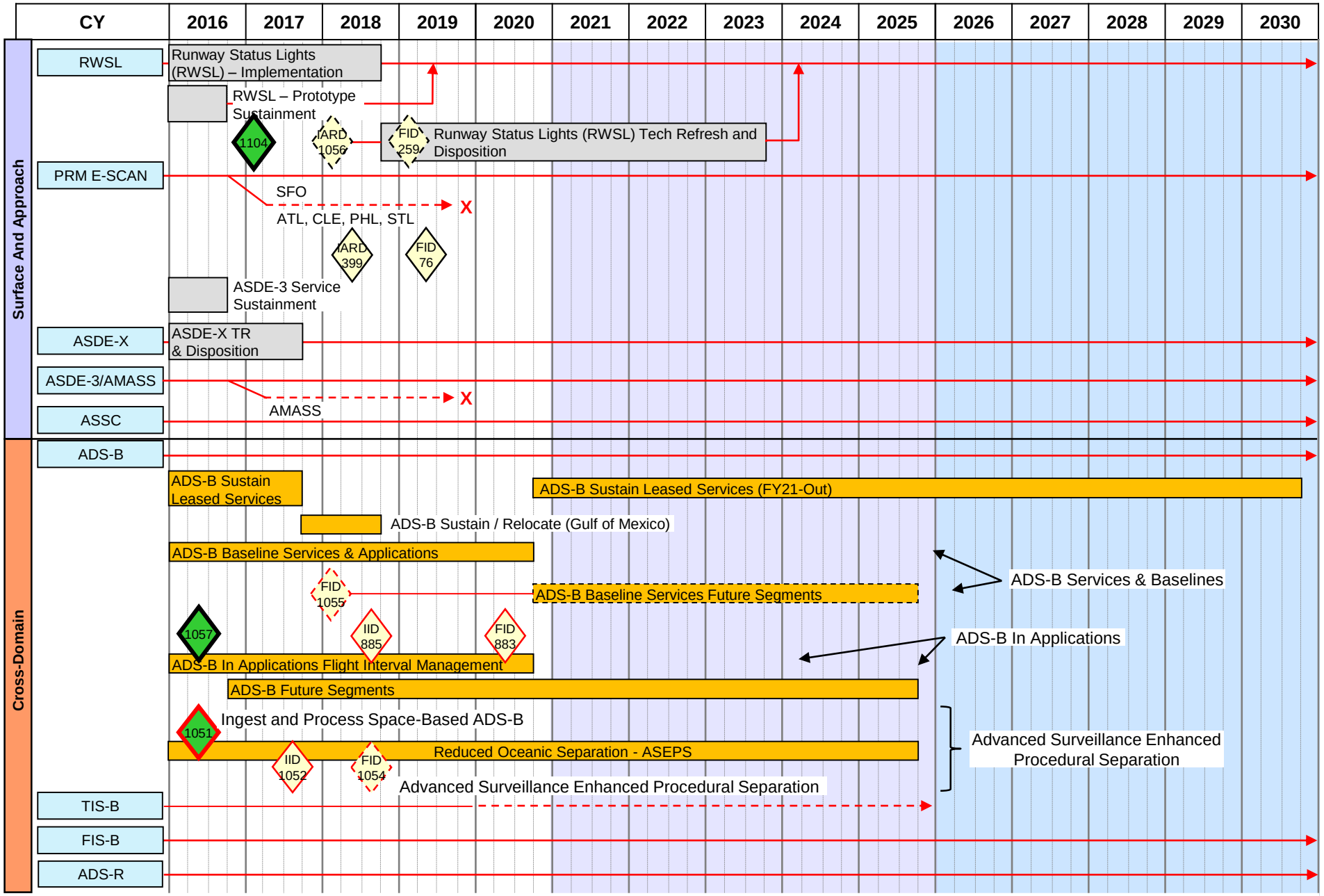
Surveillance Roadmap (3 of 4)



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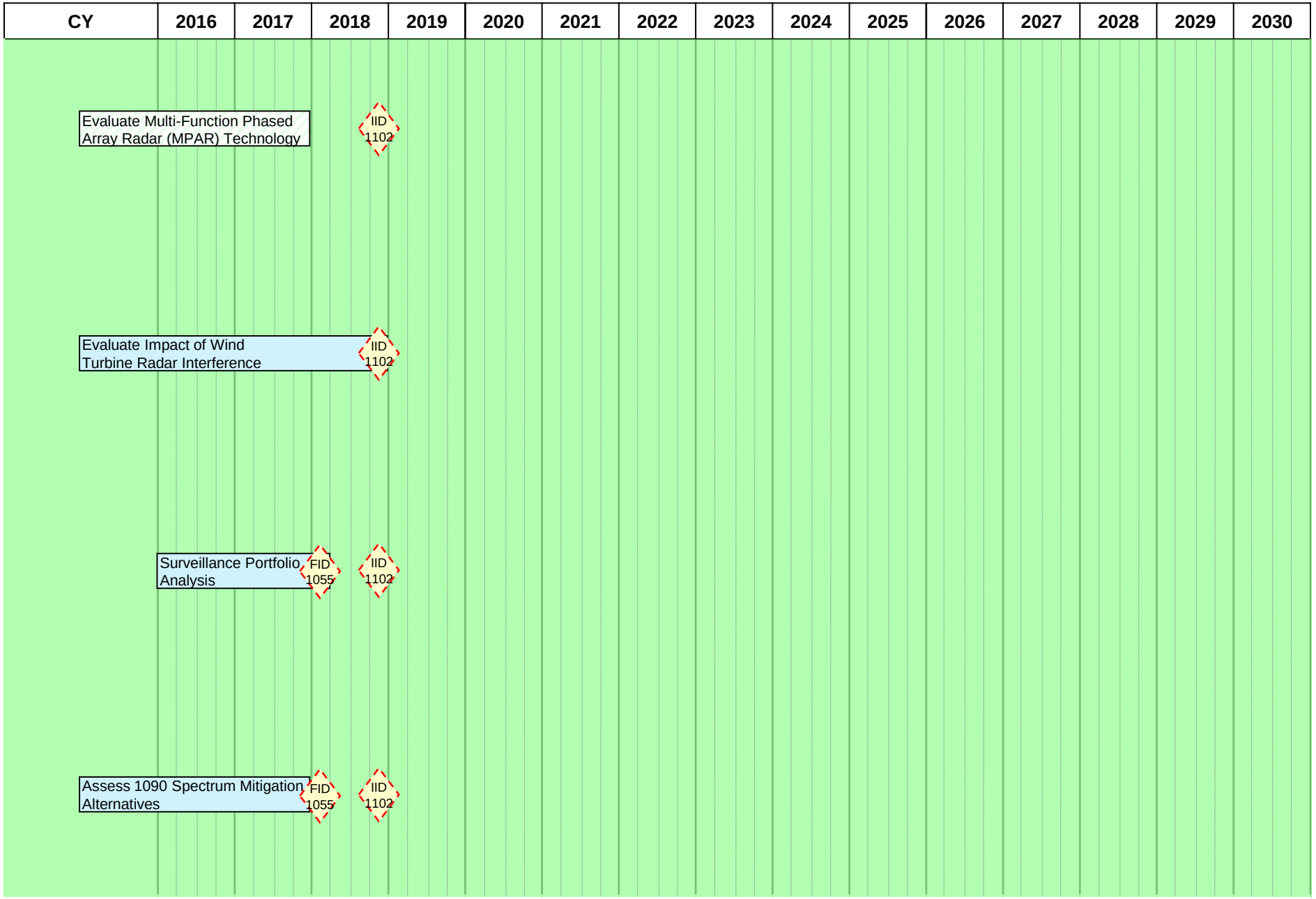
Surveillance Roadmap (4 of 4)



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Surveillance Roadmap: Assumptions

Identifier	Description
SURV-01	Migration to Automatic Dependent Surveillance—Broadcast (ADS-B) as primary means of surveillance a) Airspace rule to be in effect and backup to be in place by 2020 (compliance date) 1. Existing surveillance infrastructure will remain in place until 2020
SURV-02	Backup to mitigate loss of on-board GPS positioning source required a) Backup strategy was identified in January 2007 1. Retain all en route beacons (~150 monopulse systems with selective interrogation) 2. Retain limited set of terminal beacons at Operational Evolution Partnership (OEP)/High Density Terminals (~43 locations) b) All terminal primary radars are retained 1. Used as safety (ATC) backup 2. May also be retained for aviation security and/or weather requirements
SURV-03	Surface primary radar surveillance will not be required at selected ASDE sites a) Requires mandated equipage of all surface vehicles b) Surface surveillance to be supported by multilateration and ADS-B at these sites
SURV-04	PRM-R, with multilateration technology, will replace PRM E-Scan
SURV-05	Department of Defense/Department of Homeland Security continues to fund LRR systems through 2025
SURV-06	Digital automation system inputs are assumed for implementation of SIM

Surveillance Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
76	2019 Q2	No	Surveillance	FID	Final Investment Decision (FID) for ASDE-3 Service Sustainment
103	2020 Q2	No	Surveillance	FID	Final Investment Decision (FID) for technology refresh of beacons (ATCBI-6)
259	2019 Q1	No	Surveillance	FID	Final Investment Decision (FID) for RWSL Technology Refresh
399	2018 Q2	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for ASDE-3 Service Sustainment
801	2018 Q2	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for technology refresh of beacons (ATCBI-6)
804	2017 Q4	No	Surveillance	FID	Final Investment Decision (FID) for ASR-9 SLEP Phase 3
805	2019 Q3	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for ASR-11 Technology Refresh Segment 3
806	2020 Q3	No	Surveillance	FID	Final Investment Decision (FID) for ASR-11 Technology Refresh Segment 3
809	2018 Q2	No	Surveillance	FID	Final Investment Decision (FID) for Phase 3 Legacy Beacon (Mode S) SLEP
883	2020 Q2	Yes	Surveillance	FID	Final Investment Decision (FID) for Additional ADS-B In Applications
885	2018 Q3	Yes	Surveillance	IID	Initial Investment Decision (IID) for Additional ADS-B In Applications
1051	2016 Q2	Yes	Surveillance	Strategy (JRC)	Strategy Decision for Ingestion and Processing of Space-Based ADS-B
1052	2017 Q3	Yes	Surveillance	IID	Initial Investment Decision (IID) for SBS - Advanced Surveillance Enhanced Procedural Separation
1054	2018 Q3	Yes	Surveillance	FID	Final Investment Decision (FID) for SBS - Advanced Surveillance Enhanced Procedural Separation
1055	2018 Q1	Yes	Surveillance	FID	Final Investment Decision (FID) for ADS-B Baseline Services Future Segments
1056	2018 Q1	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for RWSL Tech Refresh
1057	2016 Q2	No	Surveillance	Strategy (JRC)	Strategy Decision for ADS-B In Applications

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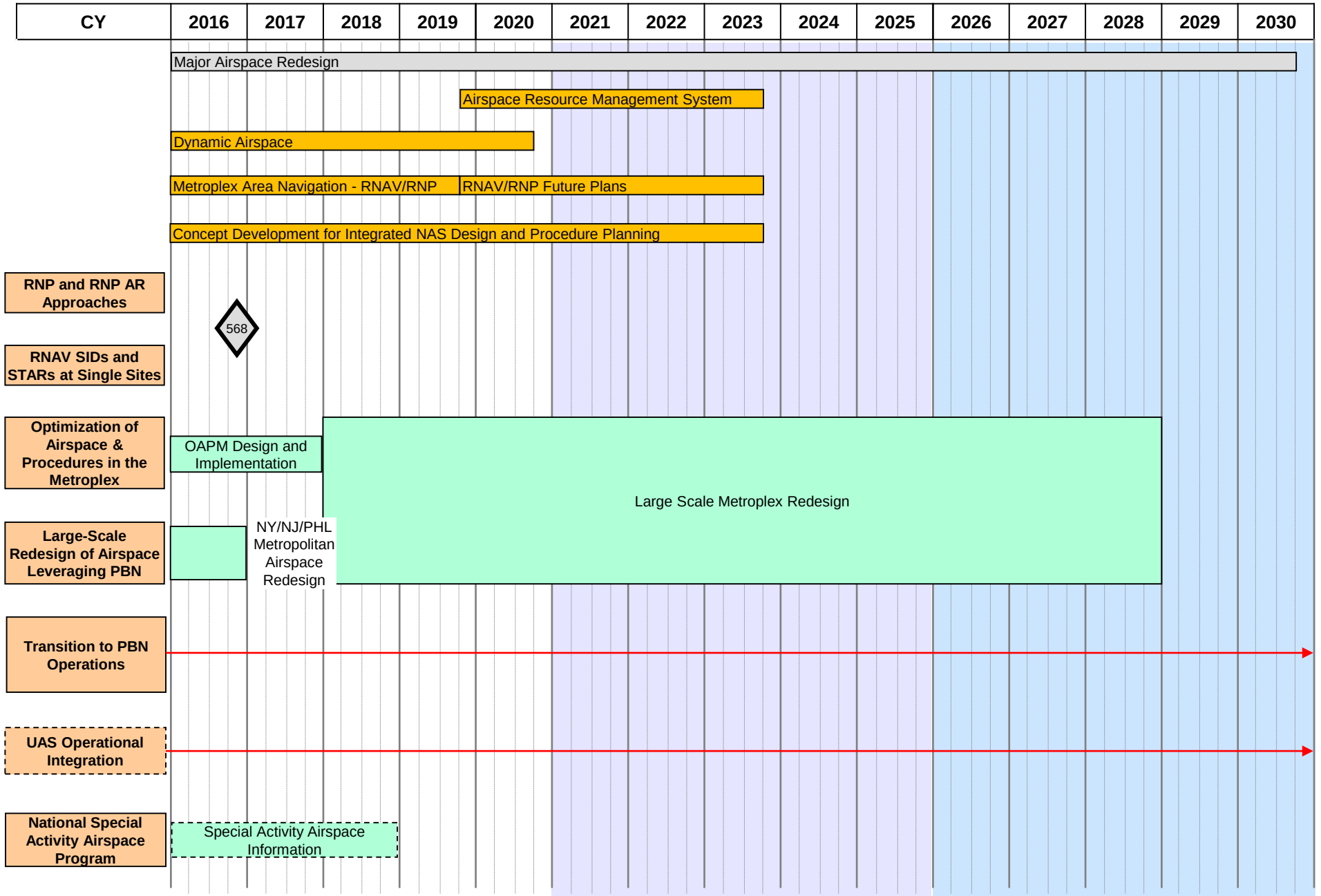
Surveillance Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1102	2018 Q4	Yes	Surveillance	IID	Initial Investment Decision (IID) for SENSR
1103	2021 Q4	Yes	Surveillance	FID	Final Investment Decision (FID) for SENSR
1104	2017 Q1	No	Surveillance	Strategy (JRC)	Strategy Decision for Runway Status Lights (RWSL) Implementation
1105	2017 Q1	No	Surveillance	Strategy (JRC)	Strategy Decision for SENSR

Airspace and Procedures

Objective: The Airspace and Procedures roadmap presents an Executive View (EV) of systems and procedures, including associated research projects, with an effect on the large-scale redesign and optimization of major airspace.

Airspace & Procedures Roadmap (1 of 3)



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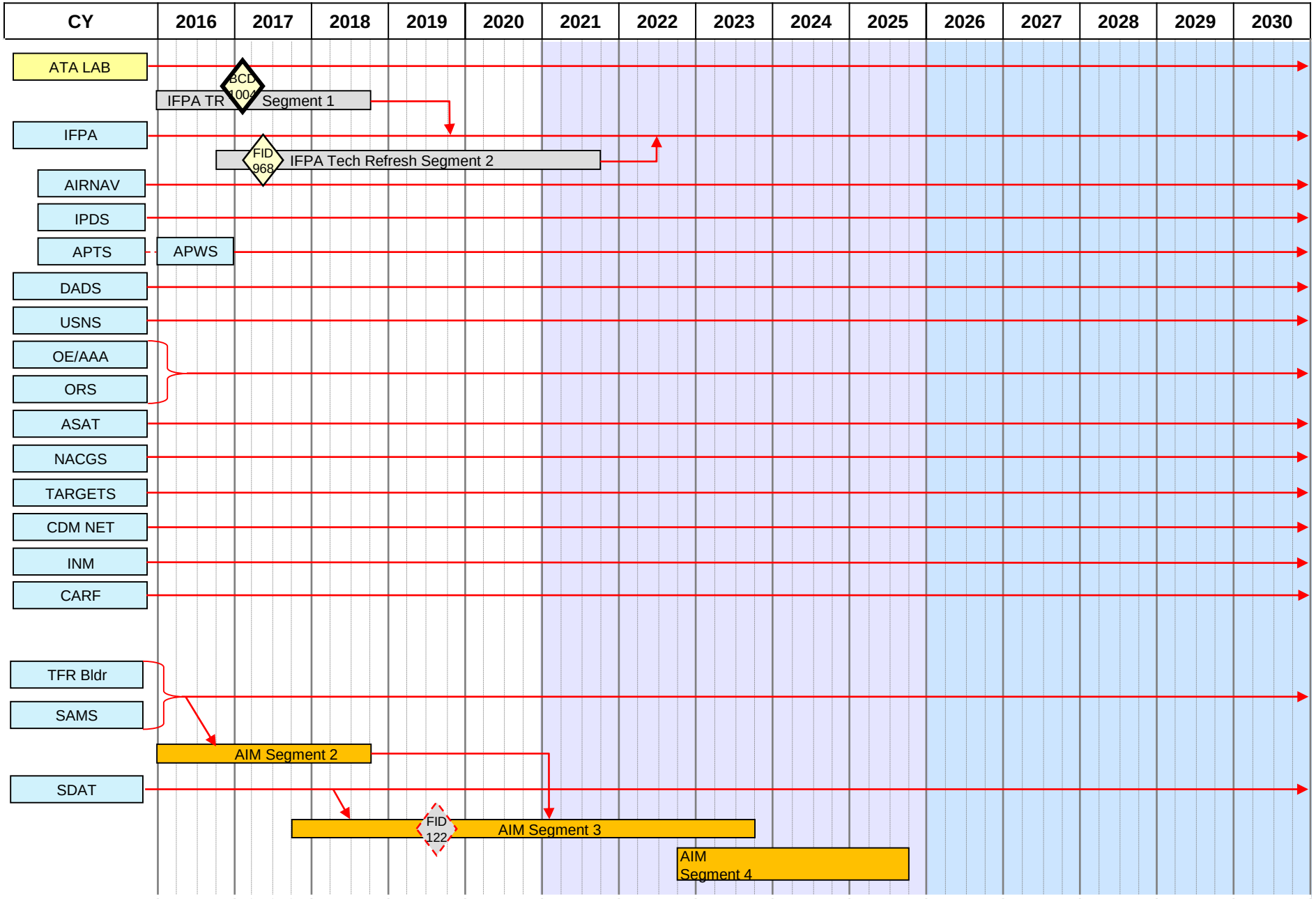
Airspace & Procedures Roadmap (2 of 3)



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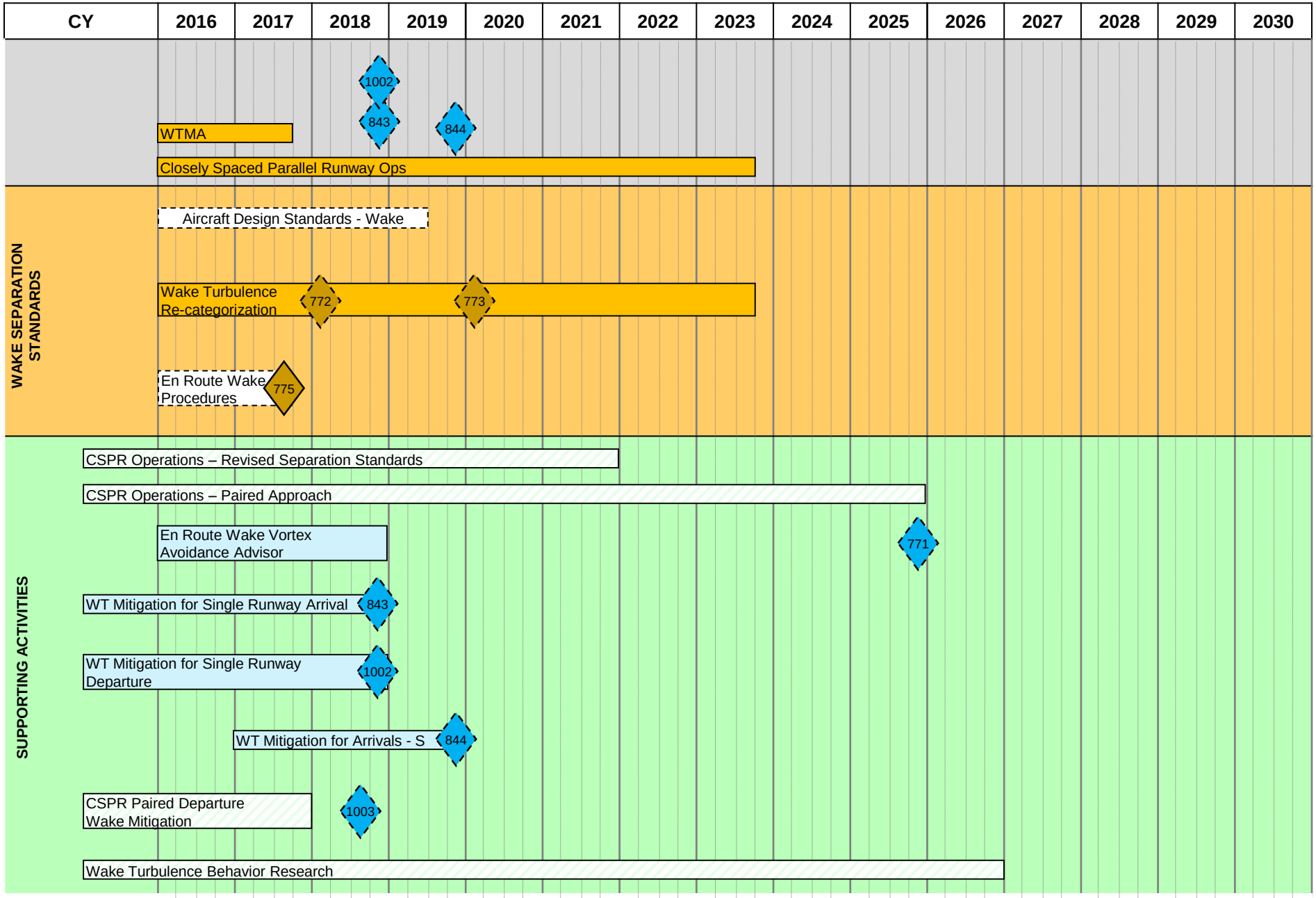
Airspace & Procedures Roadmap (3 of 3)



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Airspace & Procedures Roadmap: Assumptions

Identifier	Description
A&P-01	Airspace Modernization Assumptions a) Flexibility into any of the agency's facility plans b) Future Airspace & NASA research funding is sufficient and provides favorable benefits c) System Dependencies 1. ADS-B 2. ERAM 3. DataComm
A&P-02	Integrated Arrival/Departure Airspace (Big Airspace) Assumptions a) Key Integrated Arrival/Departure Airspace enablers: 1. Extension of 3 Mile Separation & Terminal Procedures 2. Integrated arrival/departure airspace configurations 3. Flexible sector & bi-directional routes published 4. 5 mile lateral spacing for Required Navigation Performance (RNP) enables 5 mile lateral route spacing 5. New voice system (NAS Voice System), leased circuits, and Air-Ground communications channels to handle transition 6. Cost benefits are based on creating X Integrated Arrival/Departure (Big Airspace) facilities, covering X major metropolitan areas b) Cost analysis based on general assumptions about the concept, not on any detailed requirements or technical solutions c) Benefits analysis based on extrapolating results from FT simulations to other sites given traffic forecasts and historical weather patterns d) Sites identified where large TRACON facilities exist could accommodate additional BA operational positions with refurbishment. New buildings would be needed where no large TRACON exists.

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Airspace & Procedures Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
122	2019 Q3	Yes	Automation	FID	Final Investment Decision (FID) for AIM Segment 3
568	2016 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Implementation Strategy for Human Factors Guidelines for NextGen Instrument Procedures
771	2025 Q4	No	Airspace & Procedures	Strategy (Other)	Strategy Decision on the Implementation Approach for En Route Wake Avoidance Capability
772	2018 Q1	No	Airspace & Procedures	Policy	Decision to Incorporate Wake Re-Categorization (Phase 2) into Air Traffic Control Orders
773	2020 Q1	No	Airspace & Procedures	Policy	Decision to Incorporate Wake Re-Categorization (Phase 3) into Air Traffic Control Orders
775	2017 Q3	No	Airspace & Procedures	Policy	Decision to incorporate En Route Wake Avoidance procedures into Air Traffic Control Orders
843	2018 Q4	No	Airspace & Procedures	Strategy (Other)	Strategy Decision on the Implementation Approach of Single Runway Arrival Wake Mitigation Capability
844	2019 Q4	No	Airspace & Procedures	Strategy (Other)	Strategy Decision on the Implementation Approach of Wake Turbulence Mitigation for Arrivals - Rear Gate (WTMA-RG) Capability
968	2017 Q2	No	Airspace & Procedures	FID	Final Investment Decision (FID) for IFPA Tech Refresh Segment 2
1002	2018 Q4	No	Airspace & Procedures	Strategy (Other)	Strategy Decision on the Implementation Approach of Single Runway Departure Wake Mitigation Capability
1003	2018 Q3	No	Airspace & Procedures	Strategy (Other)	Strategy Decision on the Implementation Approach of CSPR Paired Departure Wake Mitigation Capability
1004	2017 Q1	No	Airspace & Procedures	BCD	Baseline Change Decision (BCD) for IFPA Tech Refresh Segment 1

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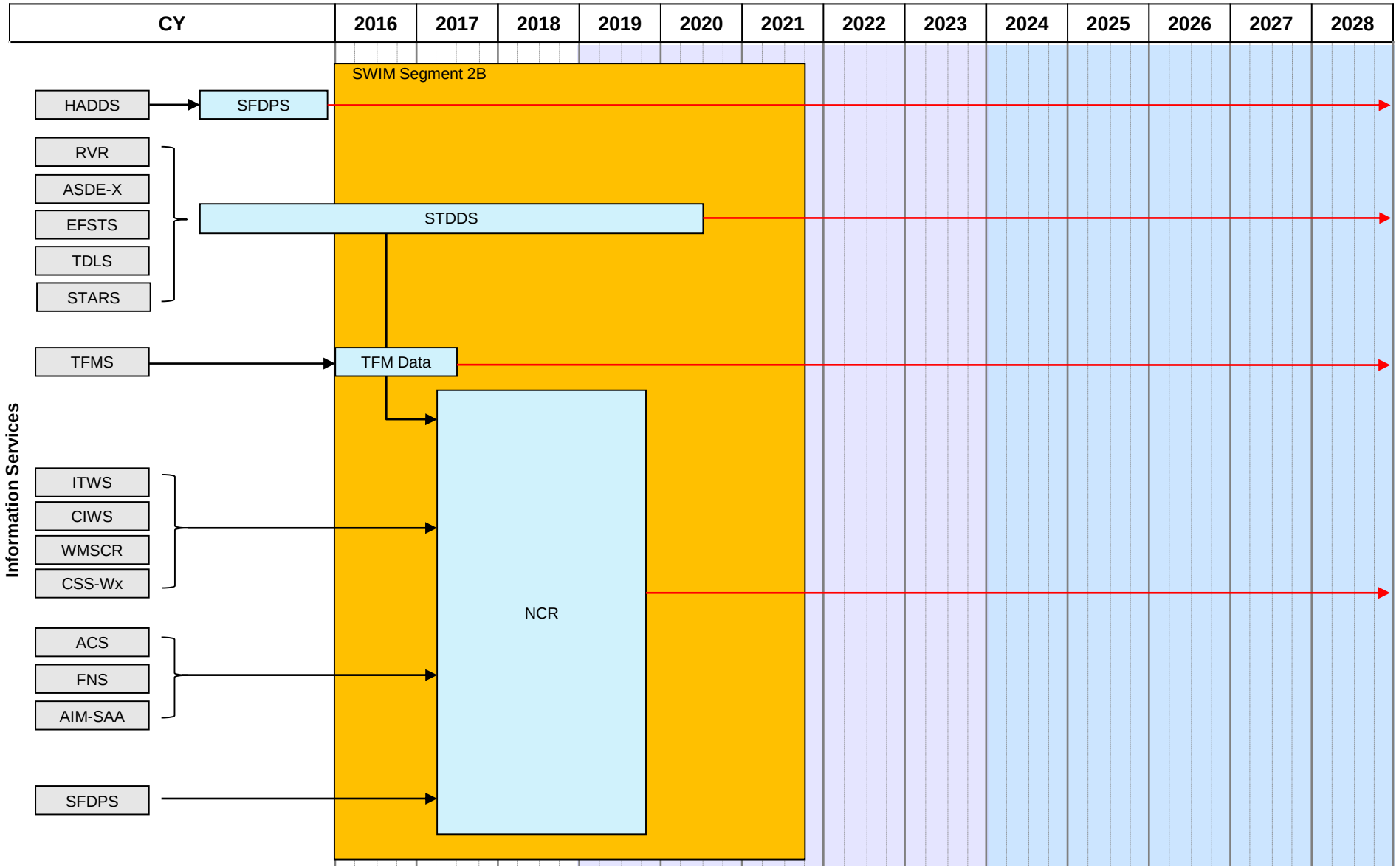
Enterprise Services

Objective : The Enterprise Services Roadmap presents an Executive View (EV) of the evolution of existing and planned enterprise services provided by NAS systems and programs and provides an outline of the major activities, decisions, and milestones. By definition, services are capabilities that exist as processes, applications, infrastructure, or any combination. They are implemented using design principles that support and promote enterprise-wide interoperability, sharing, standardization, federation, awareness, loose coupling, granularity, modularity, abstraction, reuse, and flexibility.

Enterprise Services Roadmap (1 of 5)



Enterprise Services Legend

Data Provider | Producer | Business Service | CIP Project

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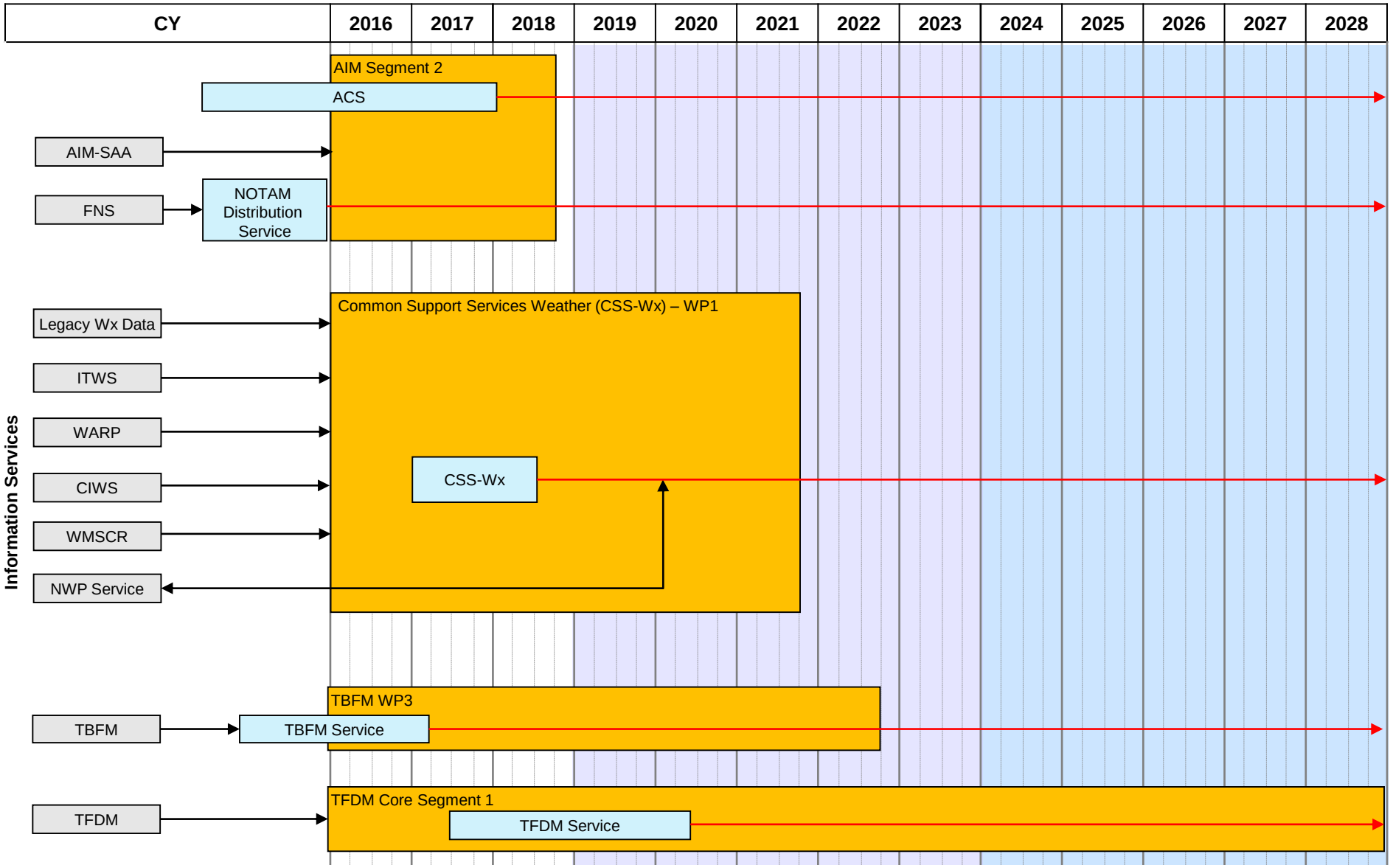
Enterprise Services Roadmap (2 of 5)



Enterprise Services Legend

Data Provider | Producer | Business Service | CIP Project

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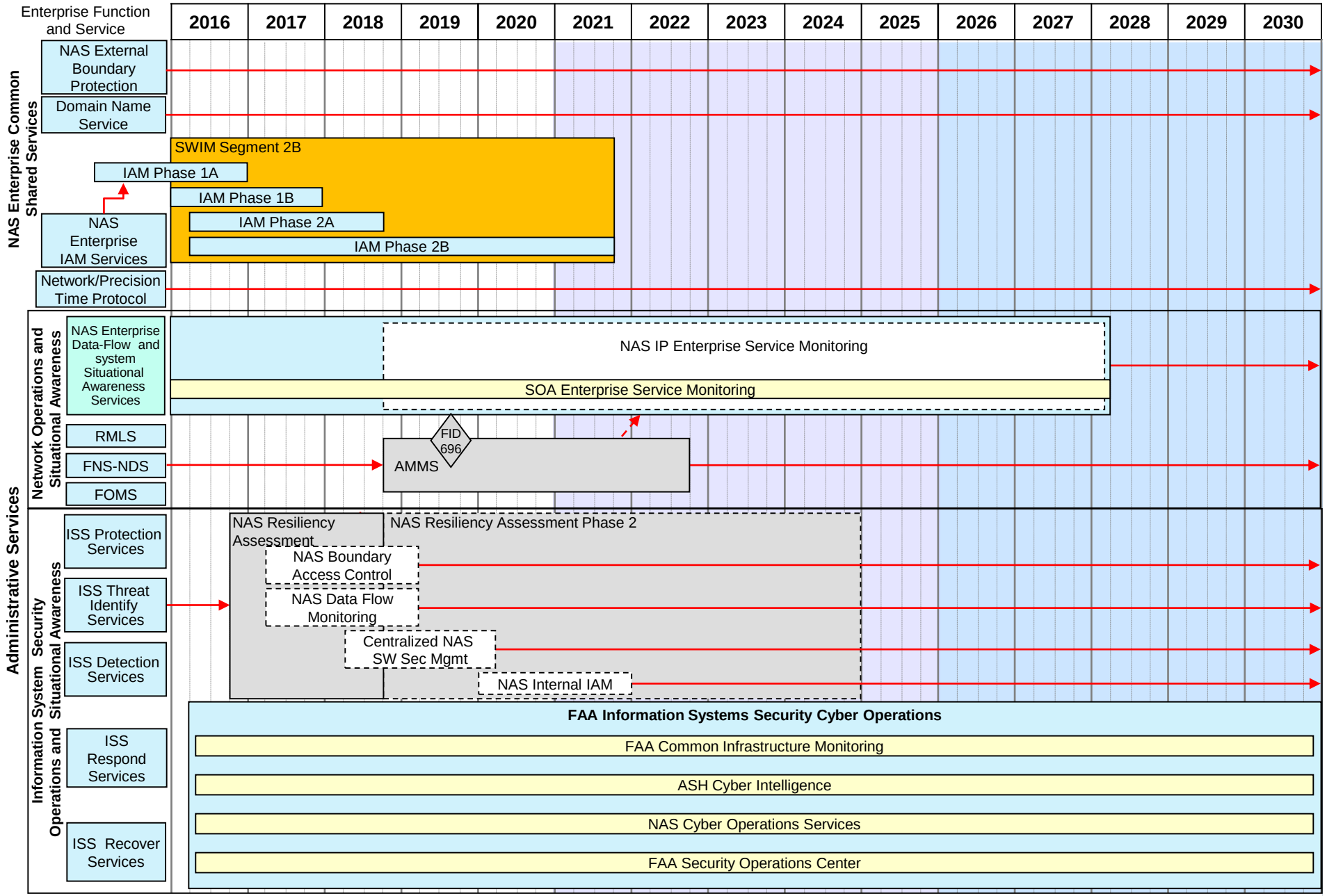
Enterprise Services Roadmap (3 of 5)



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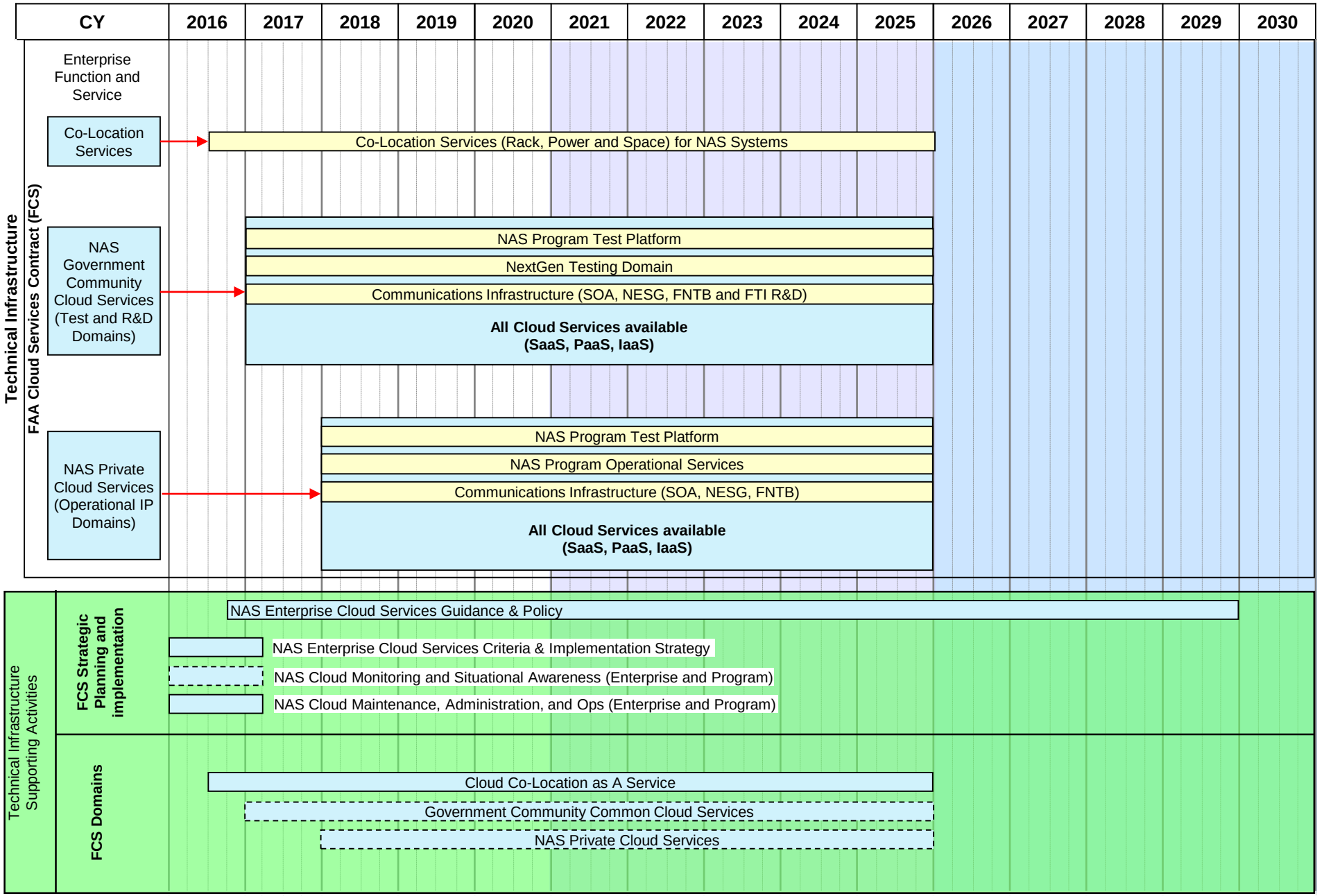
Enterprise Services Roadmap (4 of 5)



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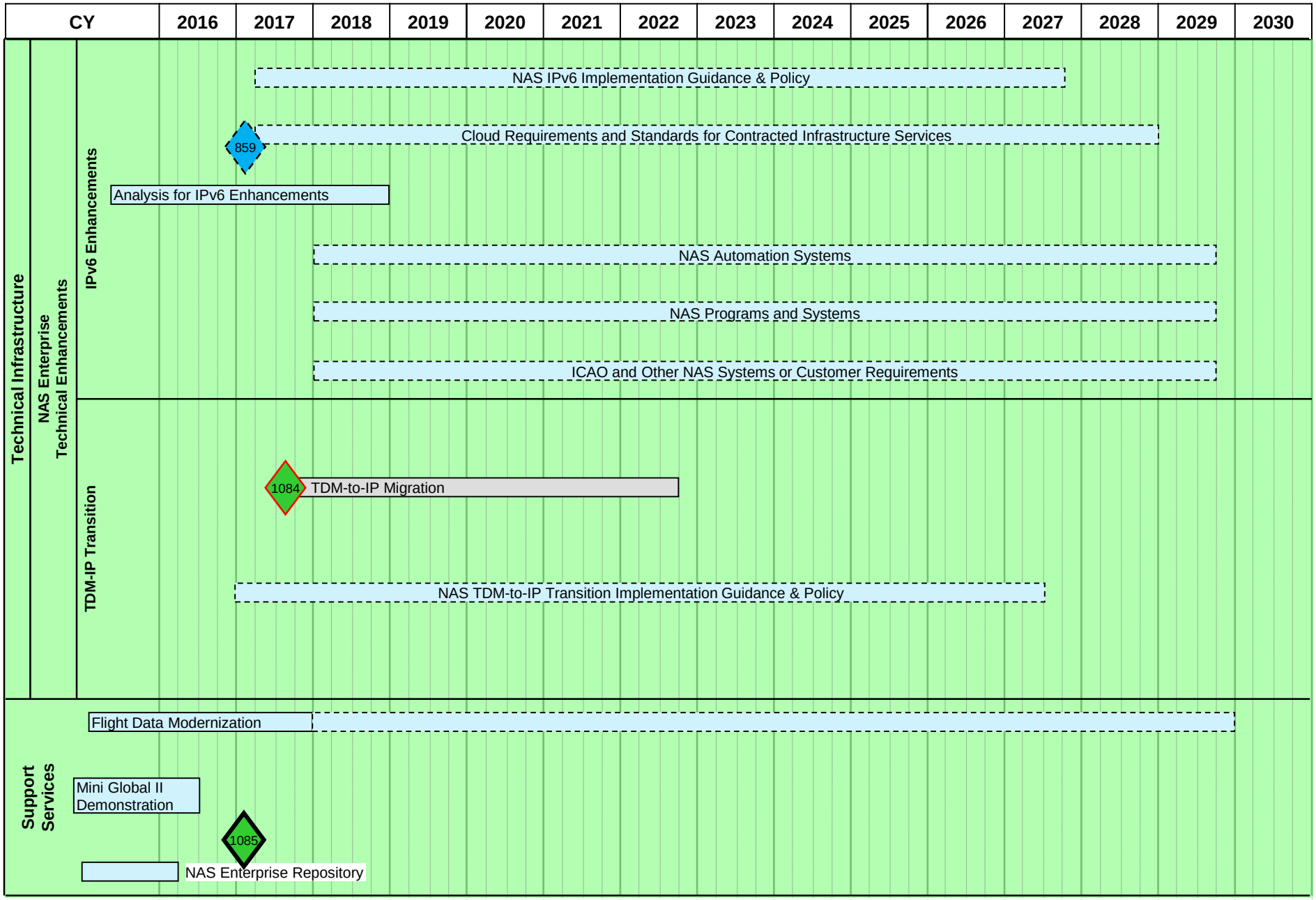
Enterprise Services Roadmap (5 of 5)



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Enterprise Services Roadmap: Mission Services Description (1 of 5)

NEMS Services Detailed Overview

Producer of SOA across SWIM Service	Enterprise Data Products/Business Service(s) Provided	Summary of Data Products
WMSCR	Altimeter Setting PIREP WMSCR Report Retrieval Service	PIREPs, Altimeter Settings
STDDS	Airport Publication Data Service (APDS)	APDS service provides Runway Visual Range (RVR) observation messages for a specific airport ISMC - system status
	Surface Movement Event (SME)	Surface Movement Event Service (SMES) provides surface movement event messages, ASDE-X position report messages, generic flight plan information, and the ASDE-X system status messages for a specific airport.
	Tower Departure Event Service (TDES)	TDES (Tower Departure Event Service). This Service provides tower departure event messages for specific airports in a given TRACON. STDDS uses information from TDLS and EFSTS messages to determine departure event information such as clearance delivery, taxi and takeoff.
ITWS	SWIM ITWS Subscription	Microburst TRACON Map, Microburst ATIS, Wind Shear ATIS, Gust Front TRACON Map, Gust Front ETI, Configured Alerts, Terminal Weather Text Normal, Terminal Weather Text Special, Precipitation 5nm, Precipitation TRACON, Precipitation Long Range, Tornado Detections, Tornado Alert, Airport Lightning Warning, SM_SEP 5nm, SM_SEP TRACON, SM_SEP Long Range, Forecast Image, Forecast Accuracy, Forecast Contour, Wind Profile, Runway Configuration, Hazard Text 5nm, Hazard Text TRACON, Hazard Text Long Range, AP Status, AP Indicated Precipitation, ITWS Status Information, Terminal Weather Graphics Text

Enterprise Services Roadmap: Mission Services Description (2 of 5)

NEMS Services Detailed Overview

Producer of SOA across SWIM Service	Enterprise Data Products/Business Service(s) Provided	Summary of Data Products
CIWS	CDDS WCS Gridded Weather Products CDDS WFS Non-Gridded Weather Products	Provides the Corridor Integrated Weather System (CIWS) gridded weather data products - VIL Mosaic - provides location of the VIL Mosaic data product to be retrieved via HTTP - VIL Forecast Mosaics - provides location of the VIL Forecast data product to be retrieved via HTTP Get - EchoTop Mosiac - provides location of the EchoTop Mosaic data product to be retrieved via HTTP Get - EchoTop Forecast Mosaics - provides location of the EchoTops Forecast data product to be retrieved via HTTP Get
ACS	ACS Airspace De-confliction ACS Business ACS Business Process ACS Business Rules ACS Data ACS Data Analytics ACS Geodetic Calculation ACS Mapping ACS Metrics ACS Notification ACS Query	AIMM Segment 2 (S2) will modernize the ingestion, integration, management, and distribution of aeronautical information (AI) by establishing the Aeronautical Common Services (ACS) and a one-stop-shop (OSS) portal. Data Products: Airport reference and configuration data, definitions and schedule information for Special Activity Airspace (SAA) including Temporary Flight Restriction (TFR) data, FNS data, procedure (RNAV/RNP) data, and obstacles, as well as supporting NAS infrastructure information.
AIM FNS	Federal NOTAM Distribution	NOTAMs
AIM SAA	Get Static SAA Put Static SAA SAA Operational Schedule SAA Schedule Notification Static SAA Update Notification	Airport reference and configuration data, definitions and schedule information for Special Activity Airspace (SAA) including Temporary Flight Restriction (TFR) data, FNS data, procedure (RNAV/RNP) data, and obstacles

Enterprise Services Roadmap: Mission Services Description (3 of 5)

NEMS Services Detailed Overview

Producer of SOA across SWIM Service	Enterprise Data Products/Business Service(s) Provided	Summary of Data Products
NCR	NAS Common Registry (NCR) is a service integration and stitching service that allow various NEMS services to be filtered based on geographical and temporal attributes and then provides as an integrated data service.	The NAS Common Reference (NCR) Service integrates information, such as current and predicted NAS status and constraint data including aeronautical information, weather, and Traffic Management Initiatives (TMIs), from disparate sources and correlates it in terms of spatial and temporal relationships. NOTAM, SAA, FCA/FEA, Re-Route, CTOP, GDP/UDP, GS, AFP, Advisory, Apt Rwy Config & Rates, Apt De-icing, Restrictions, PIREPs, AltSets, RVR, METAR, TAF, AIR/SIGMET, CCFP, ASOS/AWOS, Navigation Aid
TAMR	STARS Alert Data Message STARS IMC Status Message STARS SISO Event Message STARS Status, Track, and Flight Data Messages STARS Traffic Count Message	TAMR Services will be on-ramped via STDDS at the end of 2015. The number of SOA Services deployed and message structure is still under development. Assuming that the TAMR SOA Service will utilize the same message structure as the STARS ICD, the following messages will be published - Pending Flight Update Service - Track and Flight Plan Service (AIG200) - Status Message Service (AIG100) - Alert Data Service (AIG300) - SISO Event Service (AIG500) - IMC Status Service (AIG502) - Traffic Count Service (AIG510)

Enterprise Services Roadmap: Mission Services Description (4 of 5)

NEMS Services Detailed Overview

Producer of SOA across SWIM Service	Enterprise Data Products/Business Service(s) Provided	Summary of Data Products
TBFM	TBFM Metering Publication	TBFM Service will be composed of five message types: 1. AirInformation - Provides metering information about an aircraft; specifically: flight plan (relevant subset), STAs, ETAs, Meter Reference Elements (MREs) Assignments, and scheduling group information. 2. ConfigurationInformation - Provides the airport configuration information, per TRACON, such as the configuration change time, arrival airport acceptance rates, TRACON acceptance rates, gate acceptance rates, Meter Point acceptance rates, runway acceptance rates, super stream class configurations, and satellite airport configurations. 3. OtherInformation - Provides the TBFM metering status and interface status information. 4. AdaptationInformation - Provides, per TRACON, gate names, airport/runway/configuration names, MRE names, and stream class names. 5. SyncCategory - indidcates an impending refresh of all TBFM data
TFDM	TFDM Tower Publication TFMData	Airport information (incl. departure/arrival rates, airport configuration, runway/taxiway closures) Surface flight data (incl. surface scheduling) Flow Information (incl. DMP Data, Departure Queue Data, Winter Ops Data)
WARP	-	Weather and Radar Processor (WARP) provides Next-Generation Weather Radar (NEXRAD) data via the NEMS
TFMS Legacy	-	Surface movement event messages, ASDE-X position report messages, generic flight plan information, and the ASDE-X system status messages for a specific airport.

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Enterprise Services Roadmap: Mission Services Description (5 of 5)

NEMS Services Detailed Overview

Producer of SOA across SWIM Service	Enterprise Data Products/Business Service(s) Provided	Summary of Data Products
TFMS	TFM Data includes two primary categories of information: [1] Flight Data; and [2] Flow Data	Flow Information messages include the following TFM products: - Airspace Flow Program (AFP) - ATCSCC Advisories - Collaborative Trajectory Options Program (CTOP) - Flow Constraint Area (FCA)/ Flow Evaluation Area (FEA) - Ground Delay Program (GDP)/ Unified Delay Program (UDP) - Ground Stop (GS) - Reroutes - Airport Runway Configuration and rates - Airport Deicing - Restrictions Flight Data is essential an enhanced version of Aircraft Situation Display to Industry: The Flight Data message consists of correlated aircraft flight data information received from various NAS sources and international participants. It contains scheduling, routing, and positional information. This data consist of: - Flight Plan Data initial and subsequent amendments - Departure and arrival time notifications - Flight cancellations - Boundary crossings - Track position reports - Flight management information containing flight times date resulting to route modeling updates

Enterprise Services Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
696	2019 Q3	No	Automation	FID	Final Investment Decision (FID) for AMMS Segment 1
859	2017 Q1	No	Enterprise Services	Strategy (Other)	Strategy for NAS IPv6 Enhancements
1084	2017 Q3	Yes	Enterprise Services	Strategy (JRC)	Strategy Decision for TDM-to-IP Migration
1085	2017 Q1	No	Enterprise Services	Strategy (JRC)	Strategy Decision for Enterprise Information Management (EIM)

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Facilities

Objective : The Facilities roadmap depicts the legacy NAS facilities and the evolution towards the NextGen Future Facilities environment.

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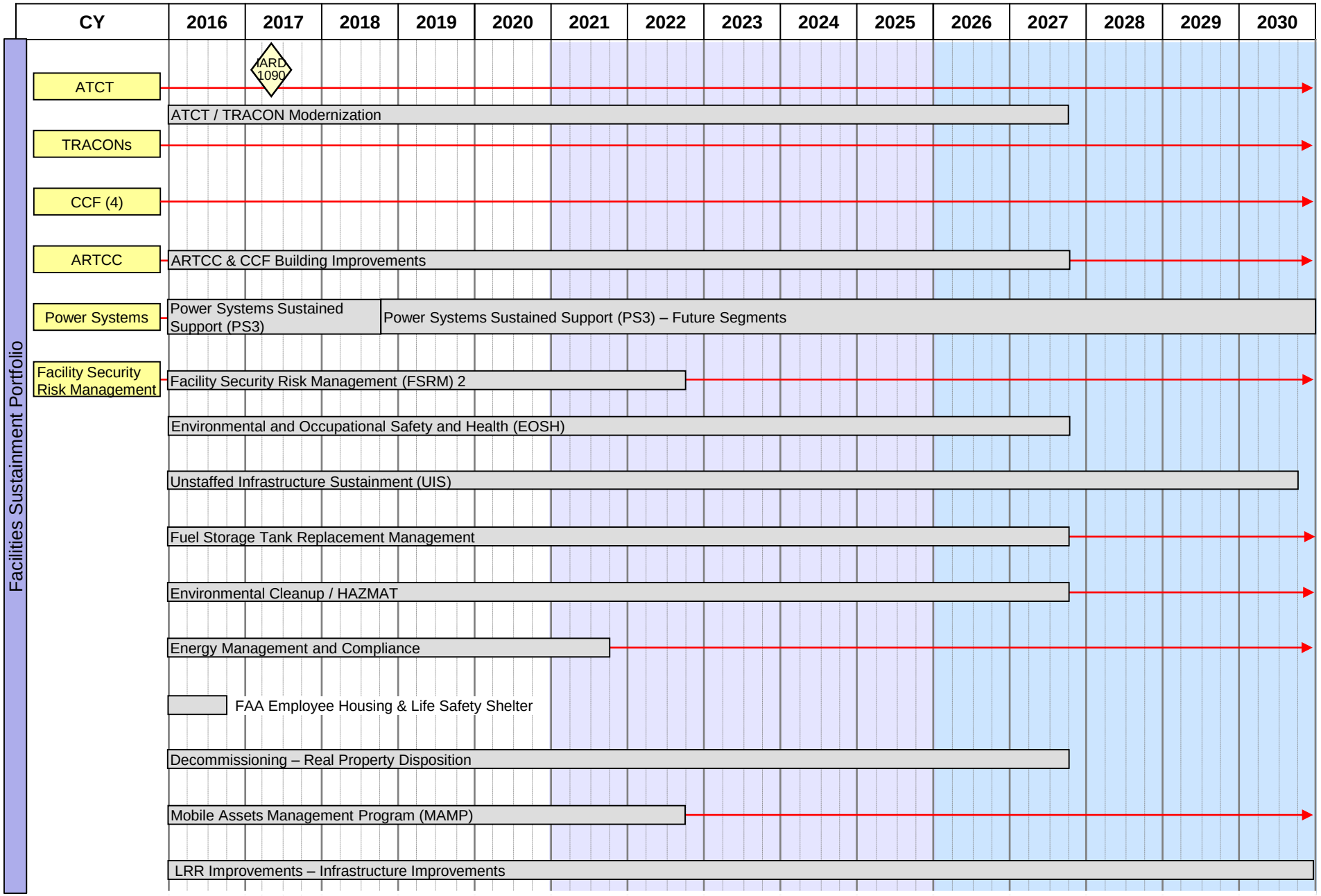
Facilities Roadmap (1 of 3)



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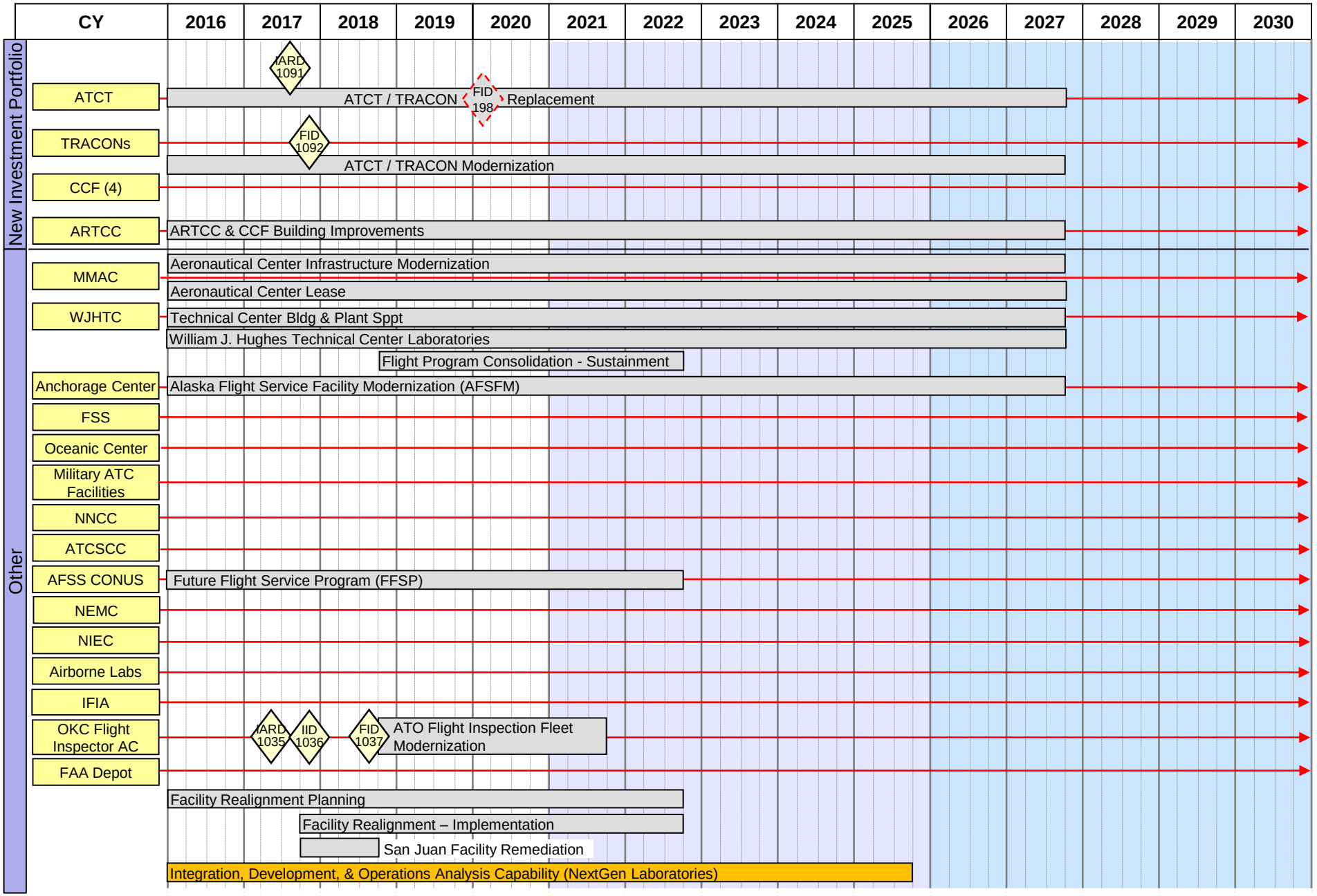
Facilities Roadmap (2 of 3)



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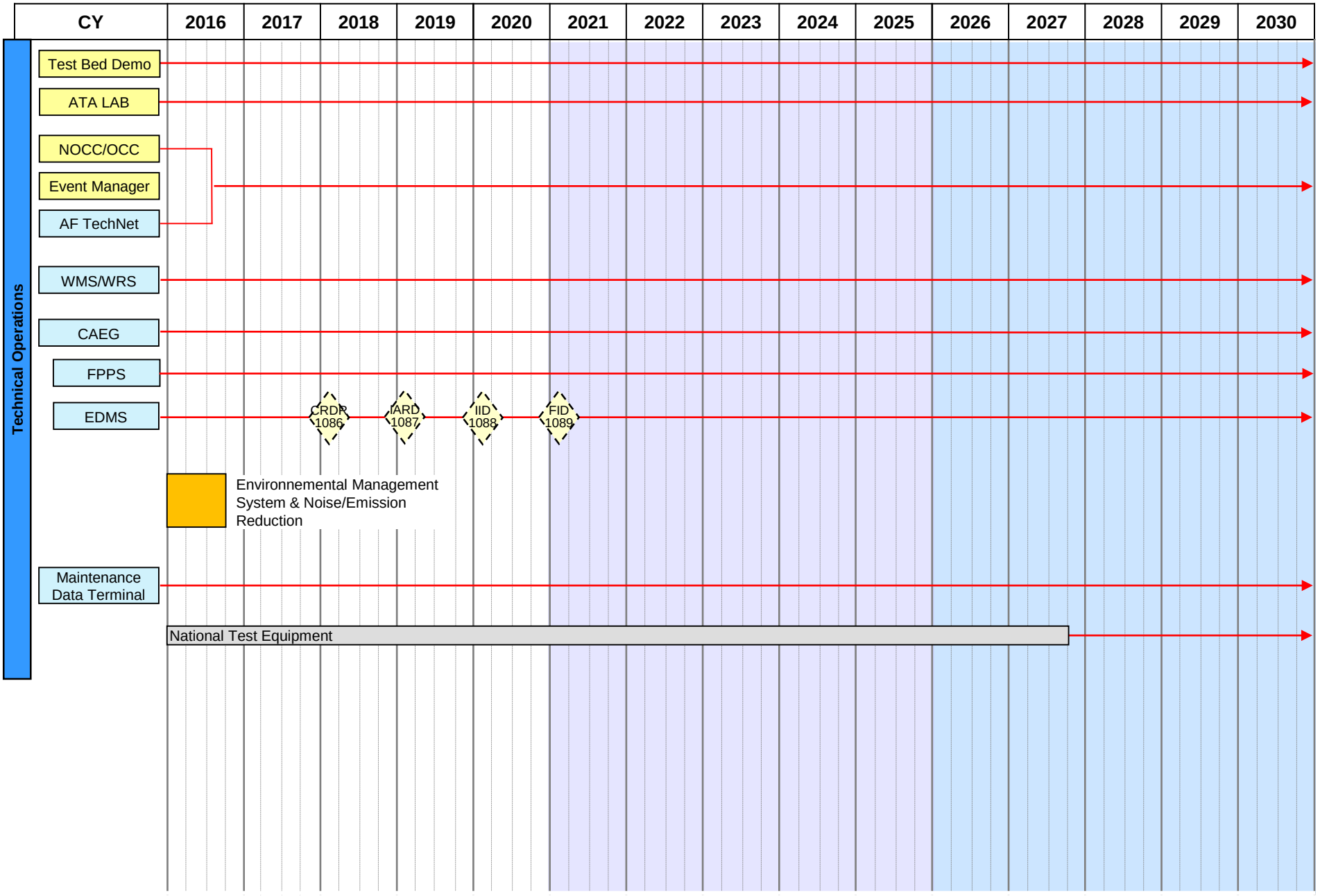
Facilities Roadmap (3 of 3)



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Facilities Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
198	2020 Q1	Yes	Automation	FID	Final Investment Decision (FID) for TFDM Segment 2
1035	2017 Q2	No	Facilities	IARD	Investment Analysis Readiness Decision (IARD) for Flight Inspection Fleet Modernization
1036	2017 Q4	No	Facilities	IID	Initial Investment Decision (IID) for Flight Inspection Fleet Modernization
1037	2018 Q3	No	Facilities	FID	Final Investment Decision (FID) for Flight Inspection Fleet Modernization
1086	2018 Q1	No	Facilities	CRDR	Concept and Requirements Definition Readiness (CRDR) Decision for Electronic Document Management System/Facility Power Panel Schedule
1087	2019 Q1	No	Facilities	IARD	Investment Analysis Readiness Decision (IARD) for Electronic Document Management System/Facility Power Panel Schedule
1088	2020 Q1	No	Facilities	IID	Initial Investment Decision (IID) for Electronic Document Management System/Facility Power Panel Schedule
1089	2021 Q1	No	Facilities	FID	Final Investment Decision (FID) for Electronic Document Management System/Facility Power Panel Schedule
1090	2017 Q2	No	Facilities	IARD	Investment Analysis Readiness Decision (IARD) for Facilities Sustainment Portfolio
1091	2017 Q3	No	Facilities	IARD	Investment Analysis Readiness Decision (IARD) for Facilities New Investment Portfolio
1092	2017 Q4	No	Facilities	FID	Final Investment Decision (FID) for New York TRACON (N90) Replacement

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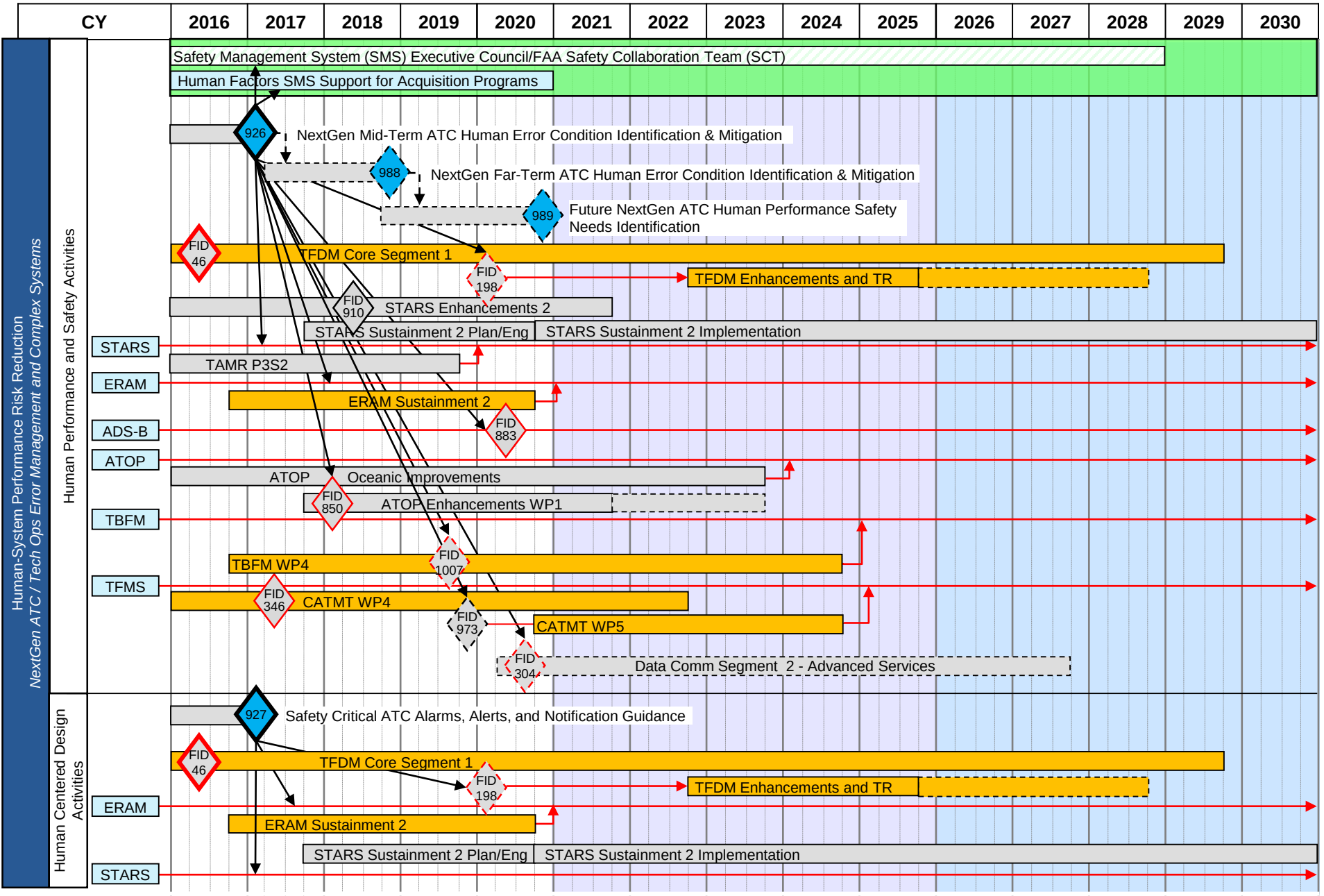
Human Systems Integration

Objective : The Human Systems Integration (HSI) Roadmap represents strategic air-ground human factors activities and their direct contributions to the evaluation, development, and evolution of NAS infrastructure. The HSI Roadmap depicts the integration of these activities with cross-cutting NAS infrastructure improvements to identify key human factors product transition points. The HSI Roadmap drives the execution of critical path activities by providing timely human factors inputs to NAS infrastructure investments and related programs.

Human Systems Integration Roadmap (1 of 4)



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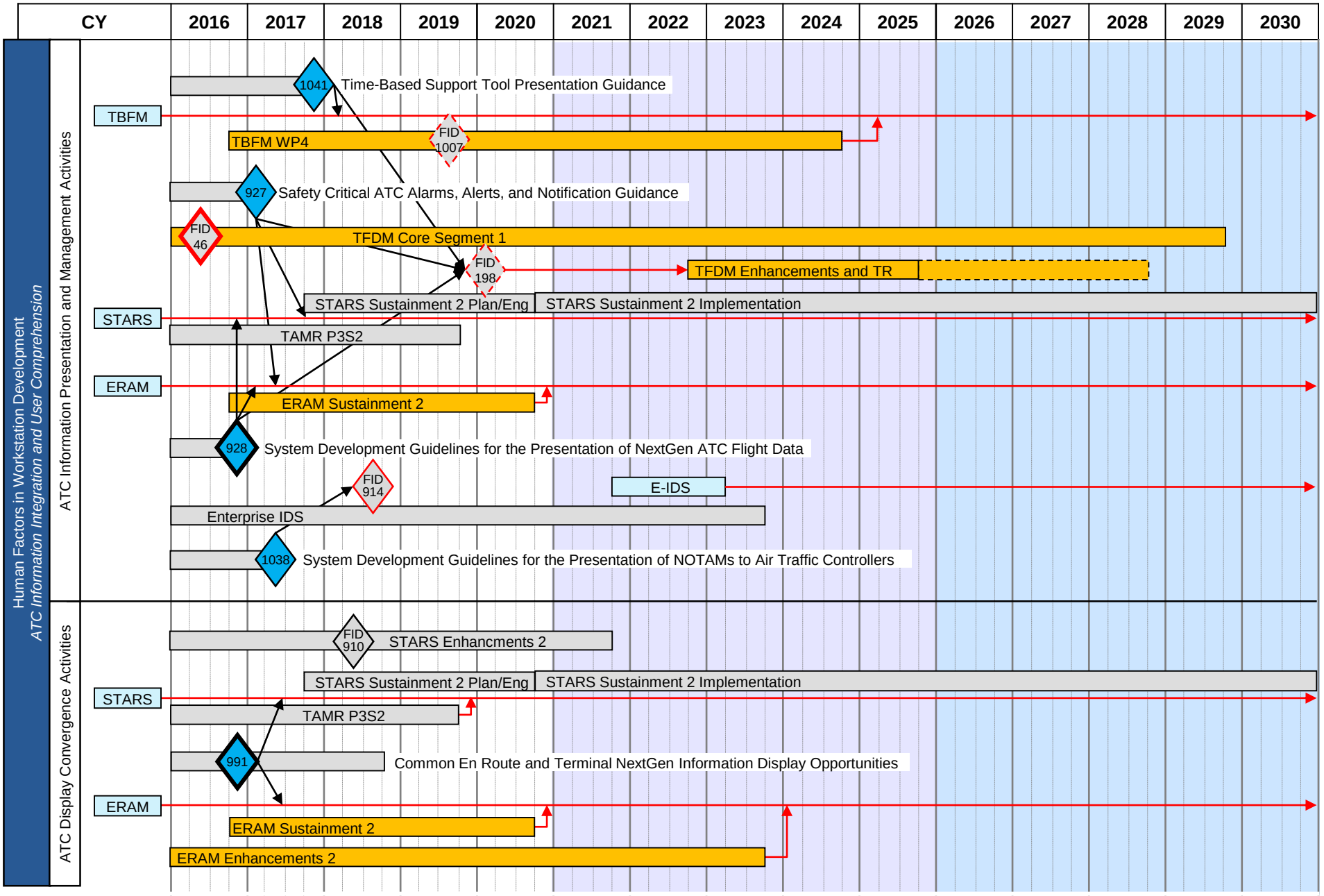
Human Systems Integration Roadmap (2 of 4)



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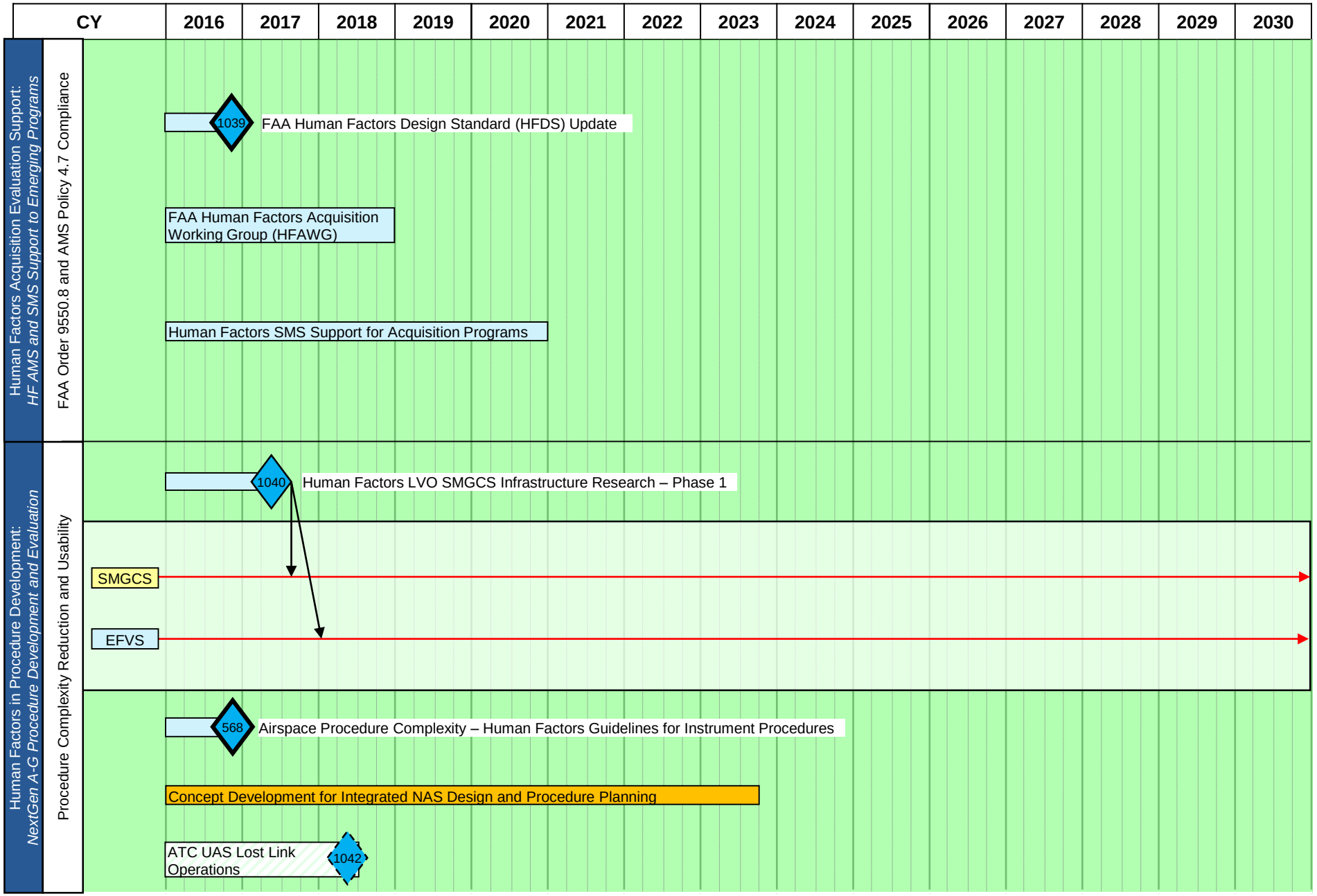
Human Systems Integration Roadmap (3 of 4)



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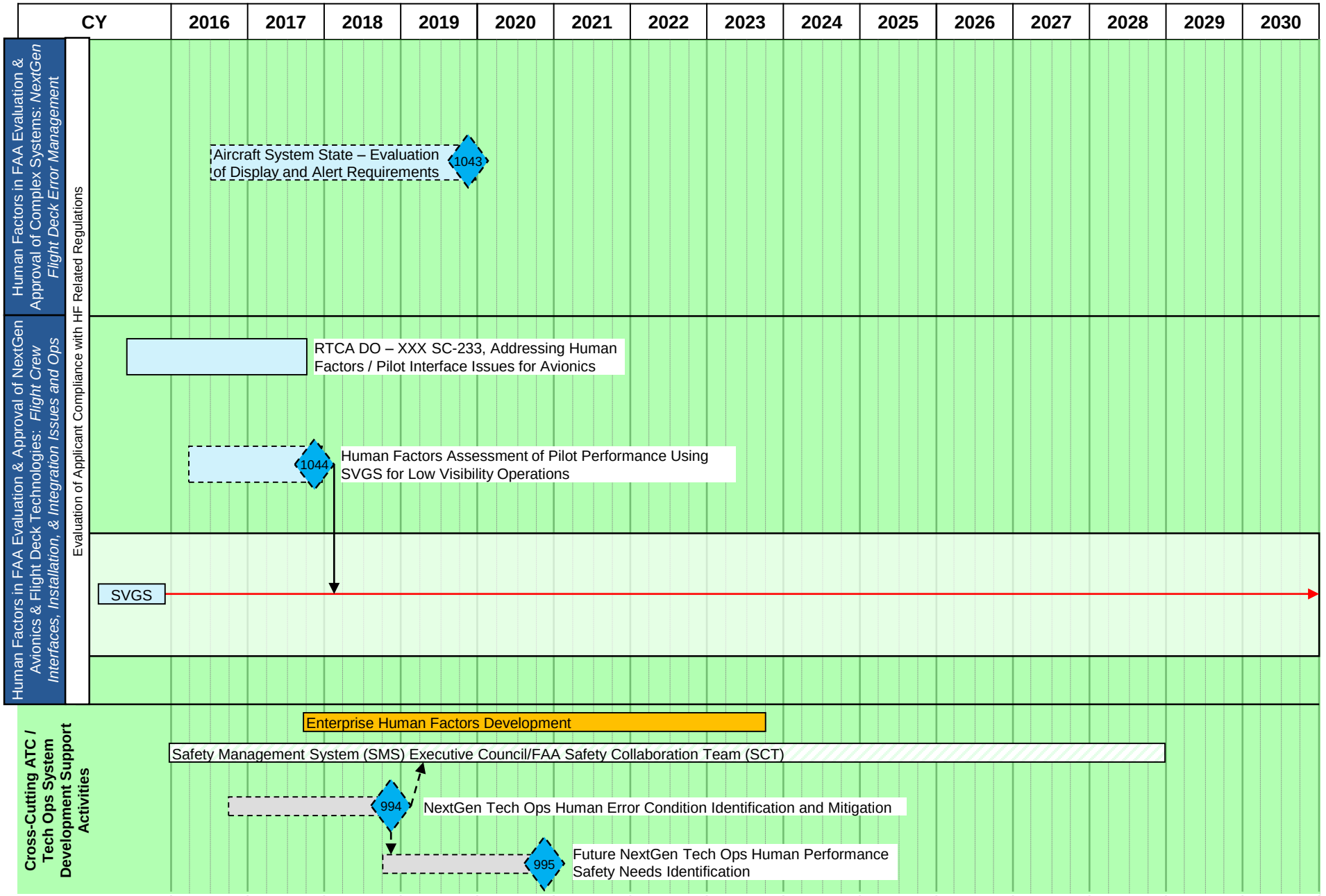
Human Systems Integration Roadmap (4 of 4)



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Human Systems Integration Roadmap Summary

Human Factors Functions	NextGen Focus Areas / Activities	Infrastructure Development Influences
Human–System Performance Risk Reduction *NextGen ATC / Tech Ops Error Management and Complex Systems*	**Human Performance and Safety** 926 988 989 994 995 **Human Centered Design** 927	• Allocation of functions between users and automation • Mitigation of human error conditions arising from the introduction of complex systems and procedures • Definition of operational human-system performance criteria • Proactive derivation of out-year human performance and safety needs
Human Factors in Workstation Development *ATC Information Integration and User Comprehension*	**ATC Information Presentation & Management** 927 928 1038 1041 **ATC Display Convergence** 991	• Human factors system development standards and guidelines • Mitigation of human factors and controller display issues • Identification of design impacts on user cognition and design alternatives • Prioritized cross-domain information and display convergence opportunities
Human Factors Acquisition Evaluation Support *Human Factors AMS and SMS Support to Emerging Programs*	**FAA Order 9550.8 & AMS Policy 4.7 Compliance** 1039	• Implementation of human factors tools, processes, and requirements for inclusion in AMS • Human factors evaluation of acquisition program requirements and SMS products
Human Factors in Procedure Development *NextGen Air-Ground Procedure Development and Evaluation*	**Procedure Complexity Reduction and Usability** 568 1040 1042	• Air-ground procedure development guidelines • Identification of NextGen complexity factors affecting human performance • Human factors charting and service standard development support
Human Factors in FAA Evaluation and Approval of Complex Systems *NextGen Flight Deck Error Management*	**Evaluation of Applicant Compliance with Human Factors Related Regulations** 1043	• Identification of human error conditions arising from the introduction of complex systems and / or systems that perform critical functions • Prioritization of human factors issues that should be investigated during AIR and AFS evaluation and approval processes • Support FAA regulatory and guidance material development
Human Factors in FAA Evaluation and Approval of NextGen Avionics & Flight Deck Technologies: *Flight Crew Interfaces, Installation and Integration Issues, and Operations*	**Evaluation of Applicant Compliance with Human Factors Related Regulations** 1044	• Identification and prioritization of human factors issues that should be investigated during AIR and AFS evaluation and approval processes • Support FAA regulatory and guidance material development to address the evaluation of new NextGen functions, equipment, and procedures

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Human Systems Integration Roadmap: Assumptions

Identifier	Description
HSI-01	The execution of program- and project-specific human factors activities are not represented in the HSI Roadmap.
HSI-02	Human factors integration points represent an identified opportunity for acquisition and procedure development programs to apply specific human factors products.
HSI-03	Human factors integration points represent the final opportunity for acquisition and procedure development programs to apply specific human factors products.
HSI-04	Acquisition and procedure development programs will coordinate with ANG-C1 throughout AMS and other processes to identify and address human factors opportunities.
HSI-05	ANG-C1 will coordinate across programs to identify and address NAS-wide human factors opportunities.

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Human Systems Integration Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
46	2016 Q2	Yes	Automation	FID	Final Investment Decision (FID) for Terminal Flight Data Manager (TFDM) Segment 1
198	2020 Q1	Yes	Automation	FID	Final Investment Decision (FID) for TFDM Segment 2
304	2020 Q3	Yes	Communication	FID	Final Investment Decision (FID) for Data Comm Segment 2
346	2017 Q2	Yes	Automation	FID	Final Investment Decision (FID) for CATMT Work Package 4
568	2016 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Implementation Strategy for Human Factors Guidelines for NextGen Instrument Procedures
850	2018 Q1	Yes	Automation	FID	Final Investment Decision (FID) for ATOP Enhancements WP1
883	2020 Q2	Yes	Surveillance	FID	Final Investment Decision (FID) for Additional ADS-B In Applications
910	2018 Q2	No	Automation	FID	Final Investment Decision (FID) for Terminal WP1
914	2018 Q3	Yes	Automation	FID	Final Investment Decision (FID) for Enterprise Information Display System (E-IDS)
926	2017 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Mid-Term ATC Human Performance Safety Requirements into the NextGen Safety Process
927	2017 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of NextGen ATC Alarms, Alerts, and Notification Guidance
928	2016 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy for Information Presentation Guidelines of Flight Data and the NextGen Data Block
973	2019 Q4	No	Automation	FID	Final Investment Decision (FID) for CATMT WP5
988	2018 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Post-Bravo ATC Human Performance Safety Requirements into the NextGen Safety Process
989	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Future NextGen ATC Human Performance Safety Needs Based on the Operational Effectiveness of Implemented NextGen Human Performance Safety Requirements
991	2016 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Prioritized Common User Interface Requirements for NextGen Terminal and En Route Workstations
994	2018 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Mid-Term and Post-Bravo Tech Ops Human Performance Safety Requirements into the NextGen Safety Process
995	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Future NextGen Tech Ops Human Performance Safety Needs Based on the Operational Effectiveness of Implemented NextGen Human Performance Safety Requirements
1007	2019 Q3	Yes	Automation	FID	Final Investment Decision (FID) for TBFM Work Package 4

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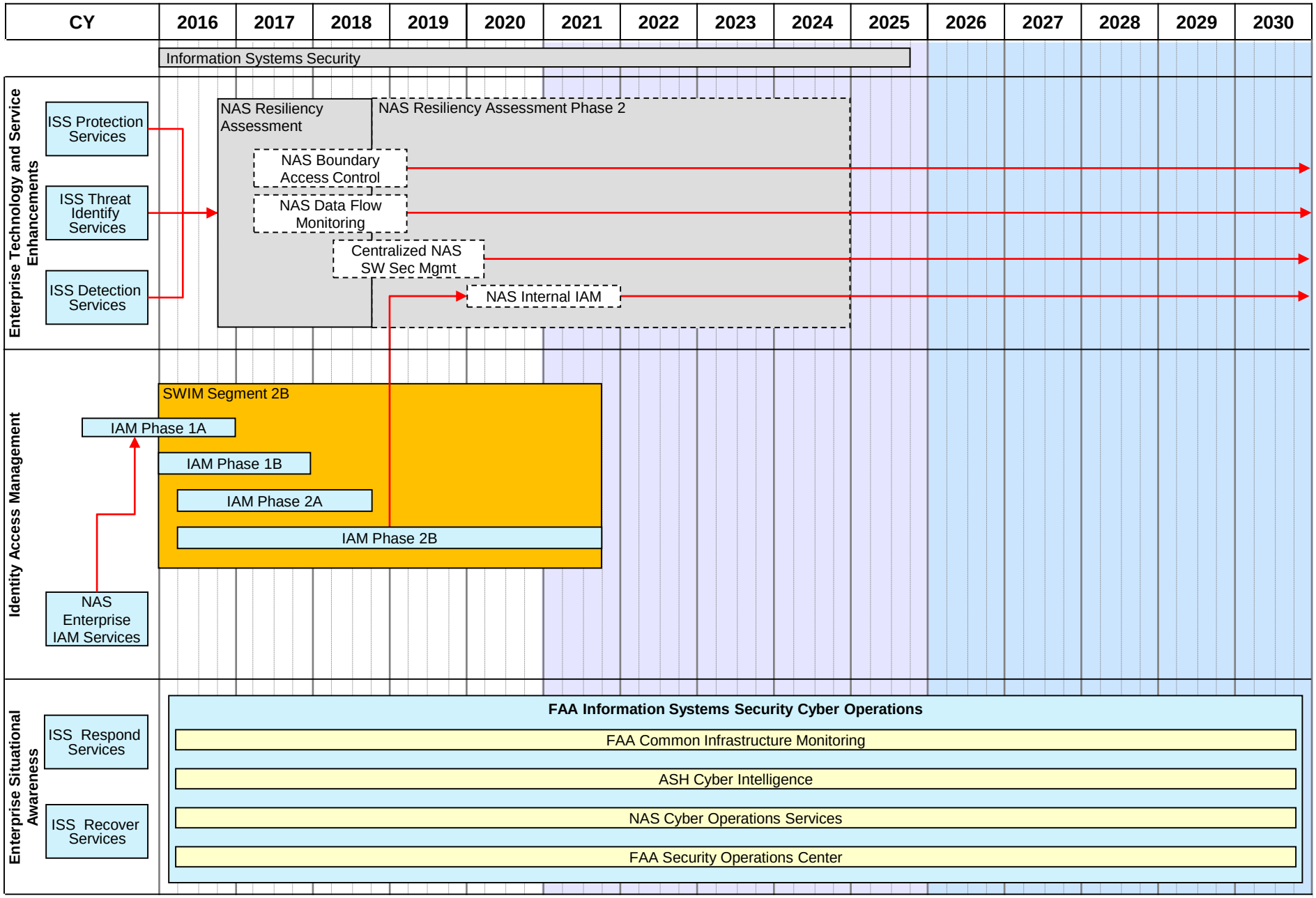
Human Systems Integration Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1038	2017 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of System Development Guidelines for the Presentation of NOTAMs to Air Traffic Controllers
1039	2016 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of FAA HFDS Updates
1040	2017 Q2	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Human Factors LVO SMGCS Guidelines – Phase 1
1041	2017 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Time Based Support Tool Presentation Guidance
1042	2018 Q2	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of ATC UAS Lost Link Guidelines
1043	2019 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Human Factors Aircraft System State Display and Alert Guidelines
1044	2017 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Human Factors SVGS Guidelines

Information Systems Security

Objective : The Information Systems Security roadmap represents the evolution of existing or planned information security services and capabilities to protect NAS systems and data from the continuous cyber threat. The roadmap depicts the information security-related services from the Enterprise Services Roadmap and the supporting policy development activities, feasibility studies, and prototypes to enable the ISS capabilities.

Information Systems Security Roadmap (1 of 2)



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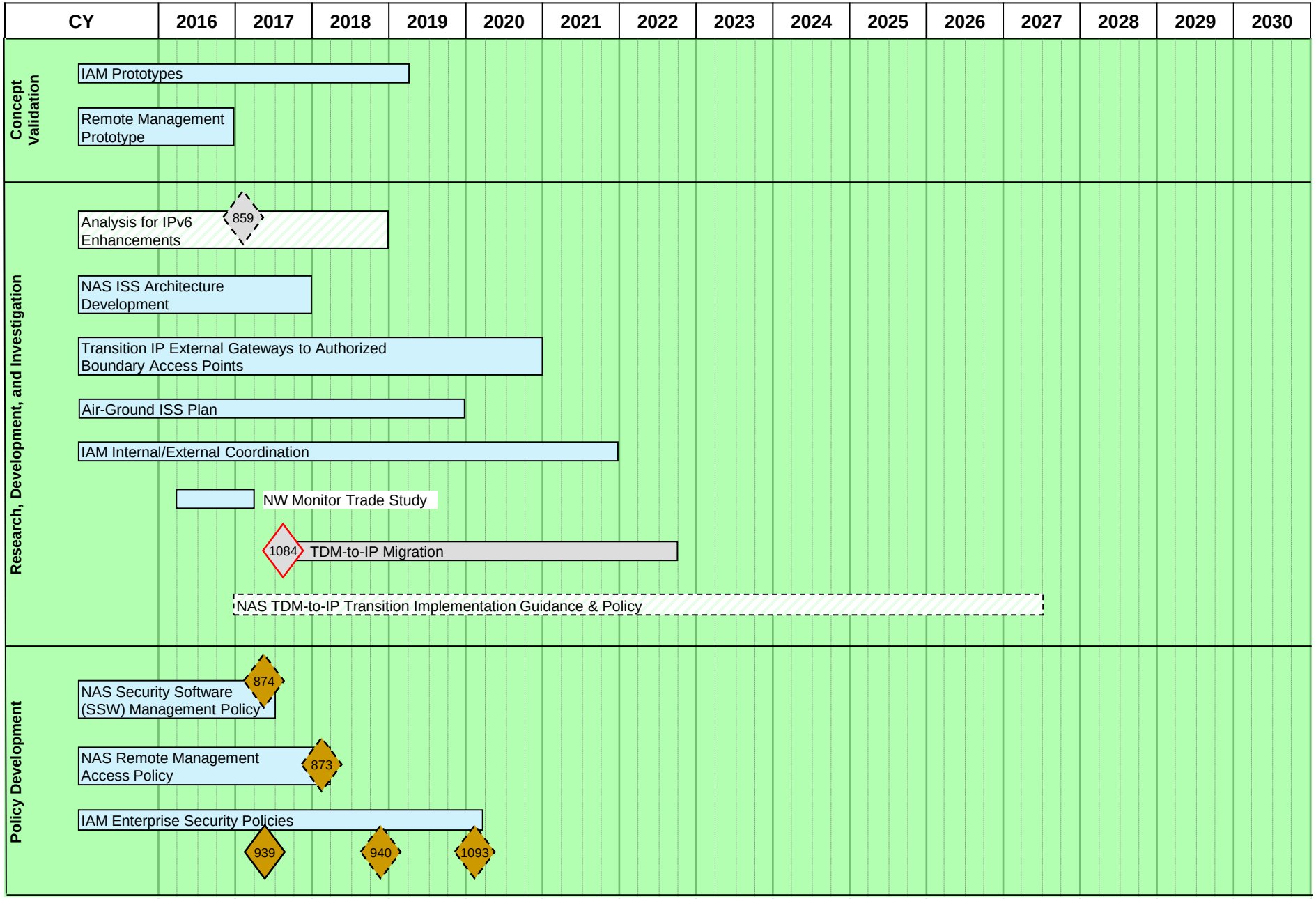
Information Systems Security Roadmap (2 of 2)



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Information Systems Security Roadmap: Service Descriptions (1 of 2)

ISS Services	Enterprise Data Functions/ Business Services Provided	Summary of Functions and Business Services
ISS Protection Services	Access control and protection mechanisms	Develops and implements the appropriate safeguards to ensure delivery of critical infrastructure services. The Protect Function supports the ability to limit or contain the impact of a potential cybersecurity event.
ISS Threat Identify Services	Manage security risks and threats, and determine suitable measures to manage those risks and threats	Develops the organizational understanding to manage cybersecurity risk to systems, assets, data, and capabilities. The activities in the Identify Function are foundational for effective use of the Framework.
ISS Detection Services	Event Detection Notifications	Develops and implements the appropriate activities to identify the occurrence of a cybersecurity event. The Detect Function enables timely discovery of cybersecurity events.
NAS Identity Access Management (IAM) Services	Identity Access Management For NAS IP systems for SOA and NON-SOA IP Services	IAM provides the capabilities for managing a NAS enterprise Public Key Infrastructure (PKI), compliant with the U.S. Common Policy for the Federal PKI Trust Framework, for use by SWIM and other NAS systems. The IAM capability will provide and manage digital certificate credentials for NAS systems and applications, which can be used for strong authentication between systems, and between NAS and non-NAS entities. Certificate validation services and security token services are also available. The SWIM architecture relies heavily on the existence of this infrastructure, and the NAS enterprise relies on IAM to meet agency and NIST requirements for strong authentication. More sophisticated capabilities (centralized data access authorization) will be available in SWIM Segment 2B.
ISS Respond Services	SOPs and Response directives	Develops and implements the appropriate activities to take action regarding a detected cybersecurity event. The Respond Function supports the ability to contain the impact of a potential cybersecurity event.
ISS Recover Services	Contingency and Recovery Plans	Develops and implements the appropriate activities to maintain plans for resilience and to restore any capabilities or services that were impaired due to a cybersecurity event. The Recover Function supports timely recovery to normal operations to reduce the impact from a cybersecurity event.

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Information Systems Security Roadmap: Service Descriptions (2 of 2)

Service Name	Service Definition
Enhanced NAS Boundary Access Control	Boundary Protection Services to improve the cyber security posture of the NAS by enhancing controls used to provide secure operational access to NAS assets from external domains; providing a layered defense-in-depth approach for accessing NAS assets via a secure gateway infrastructure. This will support operational access needs while preventing unauthorized entities and data flows from reaching the NAS critical infrastructure
Expanded NAS Data Flow Monitoring	Planned Improvement & Enhancements related to the NAS Infrastructure aimed at improving the cyber security posture via increasing situational awareness for the operational NAS cyber security monitoring capability; enables full monitoring coverage of data flows (internal and external) through implementation of cyber security sensors throughout the NAS thereby enhancing modeling and detection of anomalous data flow activities. This supports a proactive versus reactive cyber security response , fostering actions geared to minimizing potential impacts to ATC operations.
Centralized NAS Software Security Management	Improve the cyber security posture of the NAS by providing a centralized capability for security patch and malicious code protection updates; establish a standard secure method to access critical security configuration updates ;and reducing the risk of security compromise. This will support a more reliable and resilient operating NAS infrastructure.
Enhanced NAS Internal Authentication Management	This service will improve the cyber security posture of the NAS by enhancing the authentication methods for specified NAS internal users. Internal Authentication Management is identified as Phase 3 of the SWIM Identity and Access Management (IAM) capability. It will provide a centralized secure authentication capability for a defined set of NAS internal users, without affecting NAS operations, to better protect the NAS infrastructure from unauthorized access. This will support implementation of system level user controls that provide for authorized access to only those functions required to perform assigned roles and responsibilities.
System Wide Information Management (SWIM)	SWIM is scheduled to proceed in phases throughout the NextGen evolution. Currently defined phases include SWIM segment 2A (aligns with IAM 1A & IAM 1B) and SWIM segment 2B (aligns with IAM 2)

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Information Systems Security Roadmap: Assumptions (1 of 1)

Identifier	Description
ISS-01	OI 109505 Enhanced Information Security capability dates are changed to reflect funding received via NAS Resiliency Assessment.
ISS-02	The activity on Page 1 for NAS Boundary Access Control is being conducted in support of Increment 109505-01 Enhanced NAS Boundary Access Control.
ISS-03	The activity on Page 1 for NAS Data Flow Monitoring is being conducted in support of Increment 109505-02 Expanded NAS Data Flow Monitoring.
ISS-04	The activity on Page 1 for Centralized NAS SW Sec Mgmt is being conducted in support of Increment 109505-03 Centralized NAS Software Security Management.
ISS-05	The activity on Page 1 for NAS Internal IAM is being conducted in support of Increment 109505-04 Enhanced NAS Internal Authentication Management.

Information Systems Security Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
859	2017 Q1	No	Enterprise Services	Strategy (Other)	Strategy for NAS IPv6 Enhancements
873	2018 Q1	No	ISS	Policy	NAS Remote Management Access Policy Decision
874	2017 Q2	No	ISS	Policy	NAS Security Software (SW) Management Policy Decision
939	2017 Q2	No	ISS	Policy	Policy Decision to support IAM Phase 1B implementation
940	2018 Q4	No	ISS	Policy	Policy Decision to support IAM Phase 2 implementation
1084	2017 Q3	Yes	Enterprise Services	Strategy (JRC)	Strategy Decision for TDM-to-IP Migration
1093	2020 Q1	No	ISS	Policy	Decision to Approve IAM Authorization Policy

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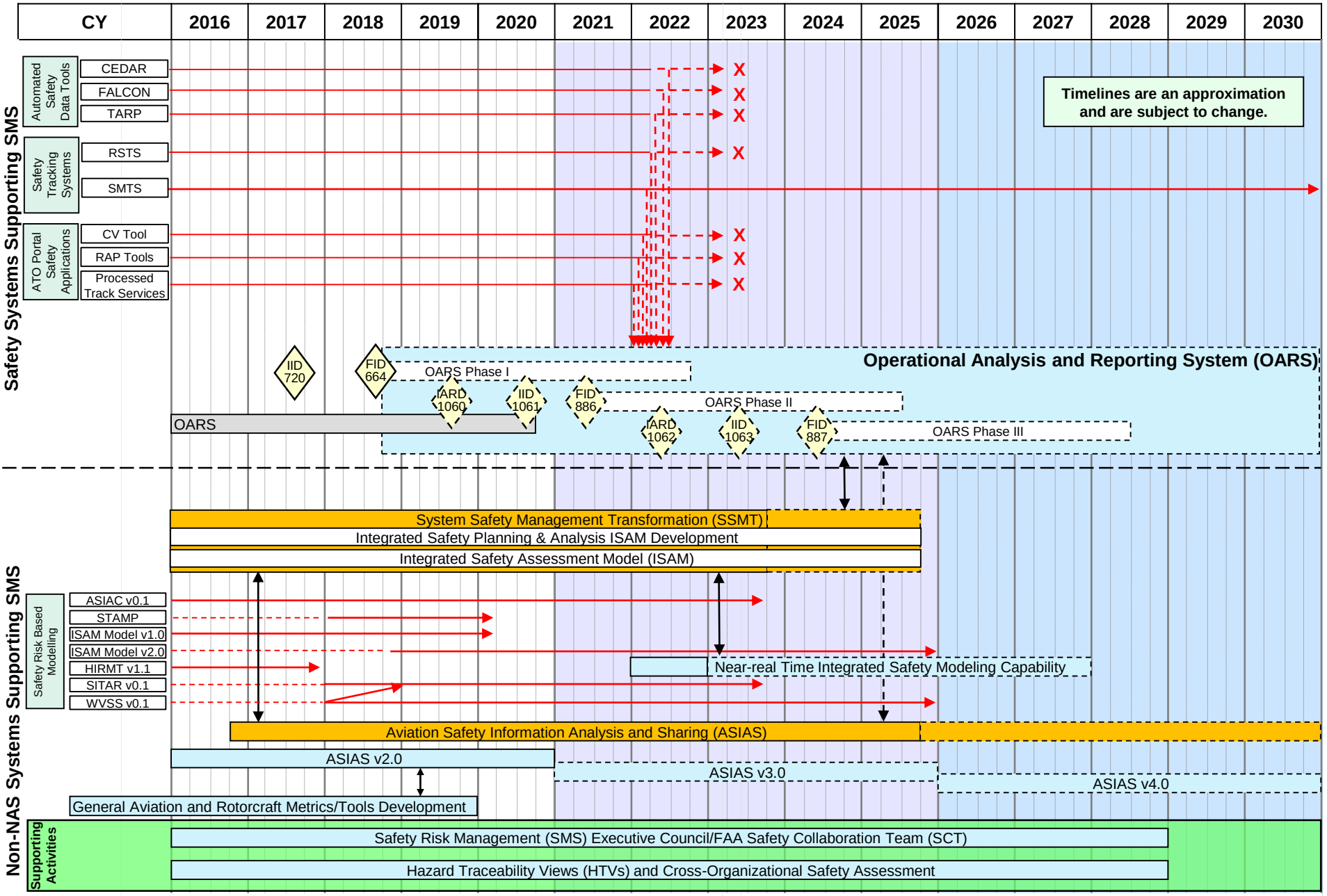
Safety

Objective : The Safety Roadmap reflects various aspects of the Safety Risk Management (SRM) process that support program level, concept/capability level and system level safety. It supports the execution of safety assessments on potential safety issues that span multiple FAA organizations, through cross-cutting stakeholder collaboration, and also provides FAA decision-makers with pertinent information to make risk-informed decisions. The Safety Roadmap integrates SRM elements with NAS operations and system acquisition milestones through the development of key safety assessments, procedures, guidance, policy and requirements that support the NextGen Enterprise System.

Safety Roadmap (1 of 3)



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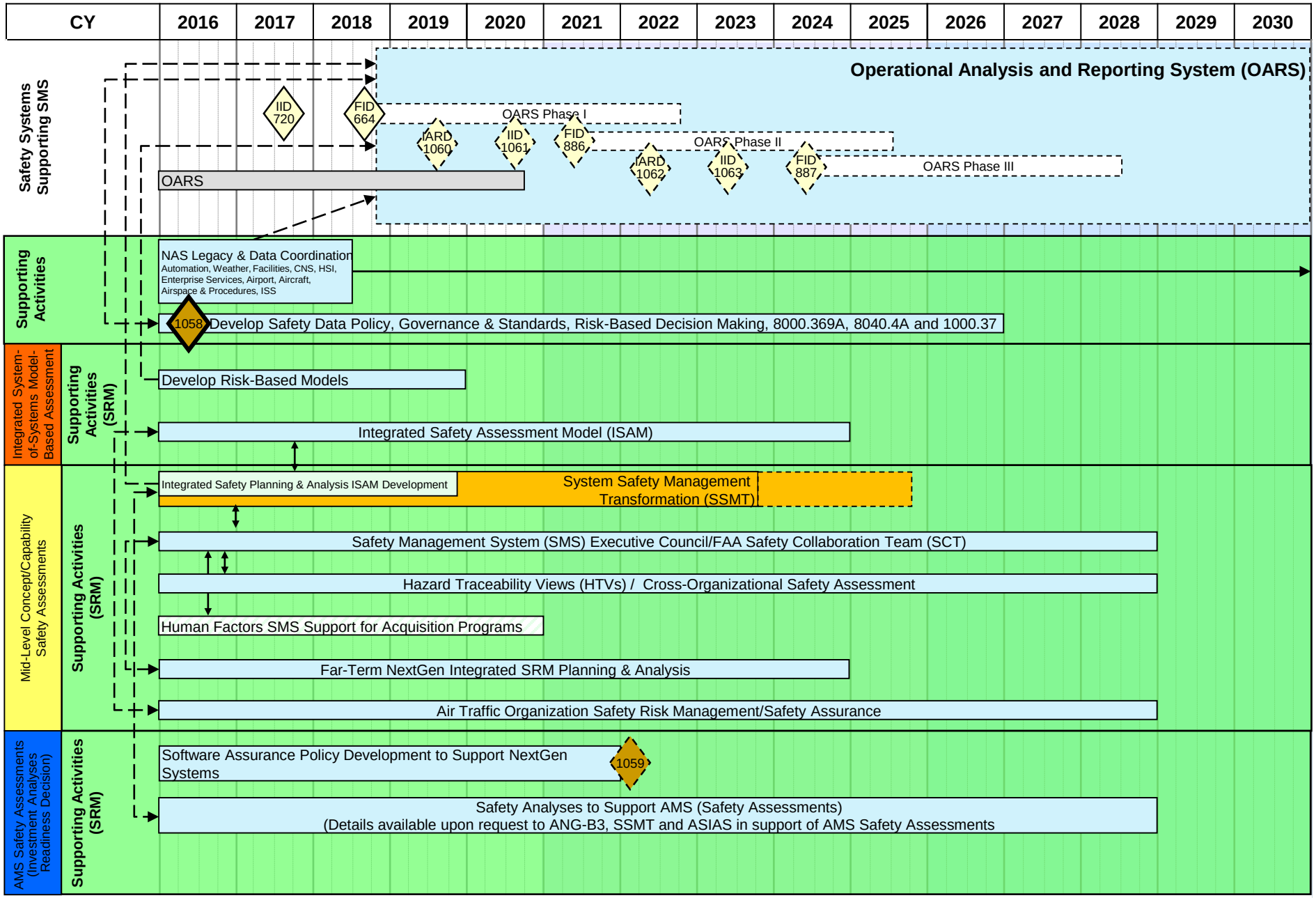
Safety Roadmap (2 of 3)



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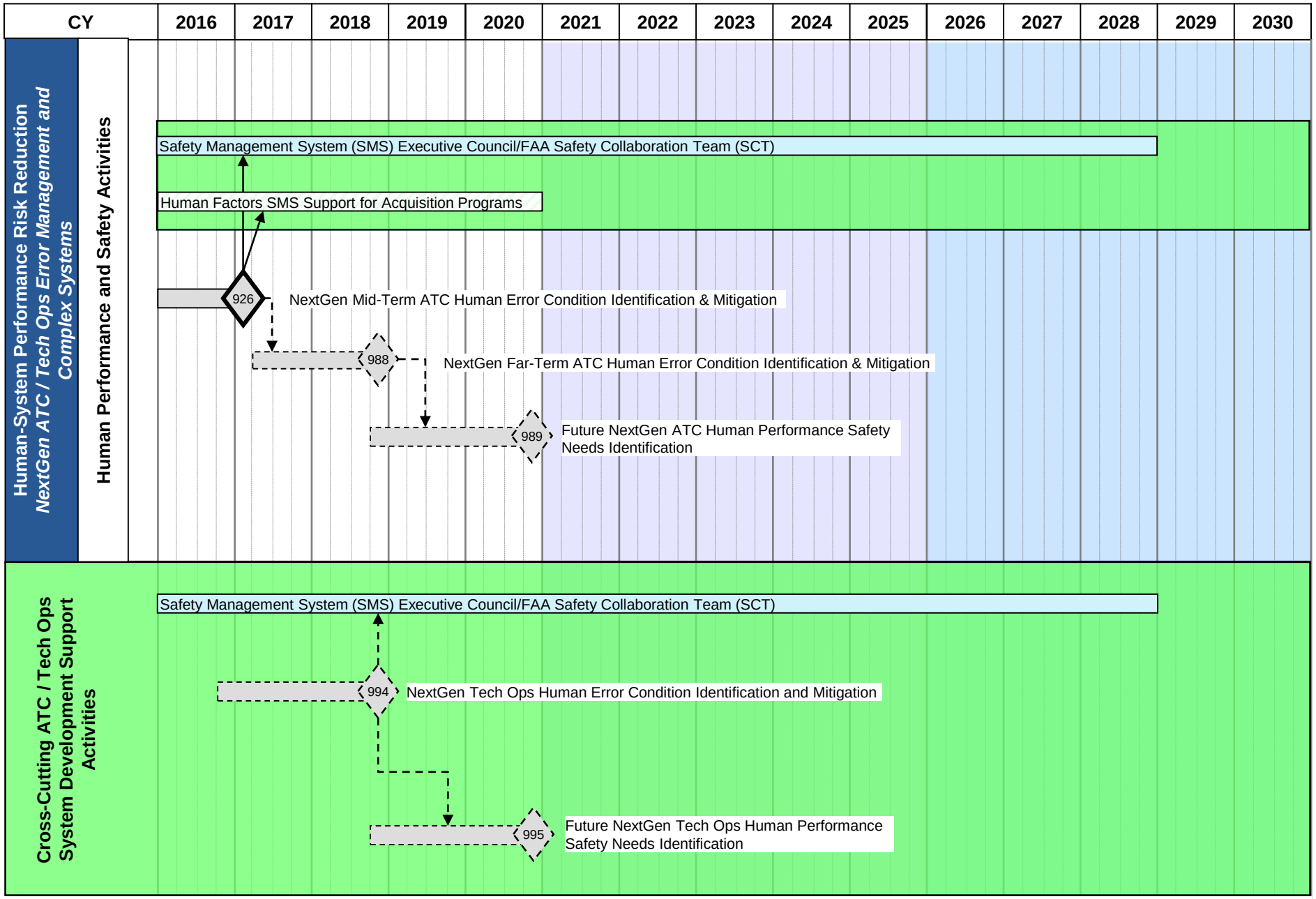
Safety Roadmap (3 of 3)



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Safety Roadmap: Assumptions

Identifier	Description
SAFE-01	ASIAS is part of the non-NAS EA. It is depicted on the Safety Infrastructure Roadmap for coordination purposes since: a) It will require NAS data. b) It will provide safety data and tools for the NAS
SAFE-02	SMS Implementations for other LOBs are part of the non-NAS EAs. These activities are depicted on the Safety Infrastructure Roadmap for coordination purposes.

Safety Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
664	2018 Q3	No	Safety	FID	Final Investment Decision (FID) for Operational Analysis and Reporting System (OARS) Phase 1
720	2017 Q3	No	Safety	IID	Initial Investment Decision (IID) for Operational Analysis and Reporting System (OARS) Phase 1
886	2021 Q2	No	Safety	FID	Final Investment Decision (FID) for Operational Analysis and Reporting System (OARS) Phase 2
887	2024 Q2	No	Safety	FID	Final Investment Decision (FID) for Operational Analysis and Reporting System (OARS) Phase 3
926	2017 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Mid-Term ATC Human Performance Safety Requirements into the NextGen Safety Process
988	2018 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Post-Bravo ATC Human Performance Safety Requirements into the NextGen Safety Process
989	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Future NextGen ATC Human Performance Safety Needs Based on the Operational Effectiveness of Implemented NextGen Human Performance Safety Requirements
994	2018 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Mid-Term and Post-Bravo Tech Ops Human Performance Safety Requirements into the NextGen Safety Process
995	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on Future NextGen Tech Ops Human Performance Safety Needs Based on the Operational Effectiveness of Implemented NextGen Human Performance Safety Requirements
1058	2016 Q2	No	Safety	Policy	Decision on FAA Order 8000.369B
1059	2022 Q1	No	Safety	Policy	Decision on Software Assurance Policy Standards for NextGen programs and systems
1060	2019 Q3	No	Safety	IARD	Investment Analysis Readiness Decision (IARD) for OARS Phase 2
1061	2020 Q3	No	Safety	IID	Initial Investment Decision (IID) for OARS Phase 2
1062	2022 Q2	No	Safety	IARD	Investment Analysis Readiness Decision (IARD) for OARS Phase 3
1063	2023 Q2	No	Safety	IID	Initial Investment Decision (IID) for OARS Phase 3

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Appendix A
Acronym List

Appendix A, Acronym List (1 of 6)

Acronym	Definition	Acronym	Definition
3D	Three dimensional (x, y, z)	**AOC**	Airline Operations Center
4D	Four dimensional (x, y, z, t)	**APNT**	Alternative Positioning, Navigation, and Timing
AAtS	Aircraft Access to SWIM	**APTS**	Automated Process Tracking System
ACARS	Addressing, Communicating, and Reporting System	**ARFF**	Aircraft Rescue and Fire Fighting
ACAS	Airborne Collision Avoidance System	**ARMT**	Airport Resource Management Tool
ACE-IDS	ASOS Controller Equipment-Information Display System	**ARSR**	Air Route Surveillance Radar
ACL	Airport Cable Loop	**ARTCC**	Air Route Traffic Control Center
ACS	Aeronautical Common Service	**ARTS**	Automated Radar Terminal System
ACFT	Aircraft	**ASAT**	Airspace Simulation and Analysis for Terminal Procedures
ACRP	Airport Cooperative Research Program	**ASDE**	Airport Surface Detection Equipment
ADAS	AWOS Data Acquisition System	**ASOS**	Automated Surface Observing System
ADS-B	Automatic Dependent Surveillance-Broadcast	**ASR**	Airport Surveillance Radar
ADS-C	Automatic Dependent Surveillance-Contract	**ASSC**	Airport Surface Surveillance Capability
AF	Airway Facility	**ASTI**	Alaska Satellite Telecommunications Infrastructure
AFSM	Alaska Flight Service Modernization	**ASWON**	Aviation Surface Weather Observation Network
AFSS	Automated Flight Service Station	**ATC**	Air Traffic Control
A/G	Air-to-Ground	**ATCBI**	Air Traffic Control Beacon Interrogator
AGIS	Airports Geographic Information System	**ATCSCC**	David J. Hurley Air Traffic Control System Command Center
AIM	Aeronautical Information Management	**ATCT**	Airport Traffic Control Tower
AirNav	Airport and Navigational Aids	**ATIS**	Automated Terminal Information System
AISR	Aeronautical Information System Replacement	**ATM**	Air Traffic Management
ALDARS	Automated Lightning Detection and Reporting System	**ATO**	Air Traffic Organization (FAA)
ALS	Automatic Landing System	**ATOP**	Advanced Technologies and Oceanic Procedures
ALSIP	Approach Lighting System Improvement Program	**ATRP**	Airport Technology Research Program
AMASS	Airport Movement Area Safety System	**AW**	Airworthiness
AMMS	Automated Maintenance Management System	**AWCS**	Airport Wireless Communications Systems
AMS	Acquisition Management System	**AWOS**	Automated Weather Observing System
ANICS	Alaska National Airspace System Interfacility Communication System	**AWSS**	Automated Weather Sensor System
ANSP	Air Navigation Service Provider	**AVS**	Office of Aviation Safety

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Appendix A, Acronym List (2 of 6)

Acronym	Definition	Acronym	Definition
BCD	Baseline Change Decision	**DASI**	Digital Altimeter Setting Indicator
BUEC	Backup Emergency Communications (VSCS)	**DBRITE**	Digital Bright Radar Indicator Tower Equipment
BWM	Bandwidth Manager	**DC**	Data Communications or DataComm
C&V	Ceiling & Visibility	**DCNS**	Data Communication Network System
CAEG	Computer-Aided Engineering Graphics	**DCS**	Data Communication System
CARF	Central Altitude Reservation Function	**DF**	Direction Finder
CAT	Category	**DHS**	Department of Homeland Security
CATMT	Collaborative Air Traffic Management Technologies	**DME**	Distance Measuring Equipment
CCF	Combined Control Facility	**DMN**	Data Multiplexing Network
CCS	Conference Control System	**DoD**	Department of Defense
CD	Common Digitizer	**DOTS+**	Dynamic Ocean Track System Plus
CDM NET	Collaborative Decision-Making Network	**DP**	Decision Point
CDTI	Cockpit Display of Traffic Information	**DSP**	Departure Spacing Program
CFE	Communication Facilities Enhancement	**DSR**	Display System Replacement
CIP	Capital Investment Plan	**DST**	Decision Support Tool
CITS	Corridors-in-the-Sky	**DUATS**	Direct User Access Terminal Service
CIWS	Corridor Integrated Weather System	**DVRS**	Digital Voice Recorder System
CONOPs	Concept of Operations	**EA**	Enterprise Architecture
CONUS	Conterminous United States	**EBP**	External Boundary Protection
CRDR	Concepts and Requirements Definition Readiness	**EC**	ATO Executive Council
CSMC	Cyber Security Management Center	**ECG**	En Route Communications Gateway
CSPO	Closely Spaced Parallel Operations	**EFB**	Electronic Flight Bag
CSPR	Closely Spaced Parallel Runways	**EFSTS**	Electronic Flight Strip Transfer System
CSS-Wx	Common Support Services-Weather	**EFVS**	Enhanced Flight Vision System
CTD	Common Terminal Digitizer	**E-IDS**	Enterprise Information Display System
CTS	Coded Time Source	**ELT**	Emergency Locator Transmitter
CY	Calendar Year	**ELVO**	Enhanced Low Visibility Operations
DAA	Detect and Avoid	**EMAS**	Engineered Material Arresting System
DADS	Digital Aeronautics Database System	**ERAM**	En Route Automation Modernization
DALR	Digital Audio Legal Recorder	**ERIDS**	En Route Information Display System

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Appendix A, Acronym List (3 of 6)

Acronym	Definition	Acronym	Definition
ETR	Emergency Transceiver	**GPS**	Global Positioning System
ETVS	Enhanced Terminal Voice Switch	**GTG**	Graphical Turbulence Guidance
EWD	Enhanced WINS Dissemination	**HADDS**	Host ATM Data Distribution System
FAA	Federal Aviation Administration	**HOST**	Host Computer System
FANS	Future Air Navigation System	**HRRR**	High Resolution Rapid Refresh (weather model)
FBWTG	FAA Bulk Weather Telecommunications Gateway	**HSI**	Human/Systems Integration
FCS	FAA Cloud Service	**HTS**	Hazard Tracking System
FCST	Forecast	**HUD**	Head-Up Display
FDIM	Flight Data Interface Modernization	**H/W**	Hardware
FDIO	Flight Data Input/Output	**IAM**	Identity Access Management
FDP2K	Flight Data Processing 2000	**IARD**	Investment Analysis Readiness Decision
FDPS	Flight Data Processing System	**ICAO**	International Civil Aviation Organization
FFSP	Future Flight Services Program	**ICMS**	Integrated Control and Monitoring System
FID	Final Investment Decision	**ICSS**	Integrated Communications Switching System
FIP	Forecast Icing Product	**IDS**	Information Display System
FIS-B	Flight Information Service-Broadcast	**IESP**	Integrated Enterprise Services Platform
FMS	Flight Management System	**IFIA**	International Flight Inspection Aircraft
FNS	Federal NOTAM System	**IFPA**	Instrument Flight Procedure Automation
FOC	Full Operational Capability	**IID**	Initial Investment Decision
FOD	Foreign Object Debris Detection	**ILS**	Instrument Landing System
FPS	Flow Publication Service	**INM**	Integrated Noise Model
FSRM	Facility Security Risk Management	**IOC**	Initial Operating Capability
FSS	Flight Service Station	**IPDS**	Instrument Procedure Development System
FST	Fuel Storage Tank	**IPE**	Instrument Procedure Development System
FT	Far-Term	**IRU**	Inertial Reference Unit
FTI	FAA Telecommunications Infrastructure	**ISAM**	Integrated Safety Assessment Model
FY	Fiscal Year	**ISD**	In-Service Decision
GA	General Aviation	**ISS**	Information Systems Security
GBAS	Ground-Based Augmentation System	**ITWS**	Integrated Terminal Weather System
GNSS	Global Navigation Satellite System	**IVSR**	Interim Voice Switch Replacement

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Appendix A, Acronym List (4 of 6)

Acronym	Definition	Acronym	Definition
JAWS	Juneau Airport Wind System	**NADIN PSN**	National Airspace Data Interchange Network Packet Switched Network
JPDO	Joint Planning and Development Office	**NAIMES**	NAS Aeronautical Information Management Enterprise Systems
JRC	Joint Resources Council	**NAS**	National Airspace System
L5	A third civil signal on Navstar GPS (1176.45 MHz)	**NASA**	National Aeronautics and Space Administration
LDIN	Lead In Light System	**NASE**	NAS Adaptation Services Environment
LDRCL	Low-Density Radio Communications Link	**NASR**	National Airspace System Resource
LED	Light-Emitting Diode	**NAVAID**	Navigational Aid
LIDAR	Laser Identification Detection and Ranging	**NBSC**	NextGen Backup Surveillance Capability
LLWAS	Low-Level Windshear Alert System	**NCR**	NAS Common Reference
LOC	Localizer	**NCV**	National Ceiling & Visibility
LOS	Line of Sight	**NDB**	Non-Directional Beacon
LP/HP	Low Power/High Power	**NEMC**	Network Enterprise Management Center
LRR	Long Range Radar	**NEXCOM**	Next-Generation VHF A/G Communication System
MALSR	Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights	**NEXRAD**	Next Generation Weather Radar
MAMP	Mobile Asset Management Program	**NextGen**	Next Generation Air Transportation System
MASPS	Minimum Aviation System Performance Standards (RTCA)	**NIDS**	NAS Information Display System
MASR	Mobile Airport Surveillance Radar	**NG**	NextGen
MB	Marker Beacon	**nm**	Nautical Mile
MDCRS	Meteorological Data Collection and Reporting System	**NMR**	NADIN MSN Rehost
MDR	Multi-Mode Digital Radios	**NNCC**	National Network Control Center
MEARTS	Microprocessor En Route Automated Radar Tracking System	**NOAA**	National Oceanic and Atmospheric Administration
MLAT	Multi-lateration	**NOCC**	National Operations Control Center
MMAC	Mike Monroney Aeronautical Center	**NOP**	National Offload Program
MODE S	Mode Select	**NOTAM**	Notice to Airmen
MOPS	Minimum Operational Performance Standards (RTCA)	**NSIP**	NextGen Segment Implementation Plan
MPAR	Multi-Function Phased-Array Radar	**NSOC**	NextGen Surface Observing Capability
MSSR	Monopulse Secondary Surveillance Radar	**NSRR**	NAS Service Registry/Repository
MT	Mid-Term	**NSWRC**	NextGen Surveillance and Weather Capability
NACGS	National Aeronautical Charting Group System	**NTEP**	National Test Equipment Program
NADIN MSN	National Airspace Data Interchange Network Message Switched Network	**NVRP**	NAS Voice Recorder Program

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Appendix A, Acronym List (5 of 6)

Acronym	Definition	Acronym	Definition
NVS	National Airspace System Voice Switch	**REIL**	Runway End Identifier Lights
NWP	NextGen Wx Processor	**RFI**	Radio Frequency Interference
NWS	National Weather Service	**RID**	Runway Incursion Device
OAPM	Optimization of Airspace/Procedures in the Metroplex	**RMLS**	Remote Maintenance and Logging System
OARS	Operational Analysis and Reporting System	**Rn**	Release n (n = 1, 2,…N)
OASIS	Operational and Supportability Implementation System	**RNAV**	Area Navigation
Obs	Observation	**RNP**	Required Navigation Performance
OCAT	Oceanic Tactical Trajectory	**RPI**	Relative Position Indicator
OCC	Operations Control Center	**RTCA**	Previously known as Radio Technical Committee for Aeronautics
ODALS	Omnidirectional Approach Lighting System	**RVR**	Runway Visual Range
OEAAA	Obstruction Evaluation/Airport Airspace Analysis	**RVSM**	Reduced Vertical Separation Minima
OFDPS	Offshore Flight Data Processing System	**RWI**	Reduced Weather Impact
OI	Operational Improvement	**RWSL**	Runway Status Lights
Ops	Operations	**SAA**	Special Activity Airspace
ORS	Obstacle Repository System	**SAIDS**	Systems Atlanta Information Display System
PAPI	Precision Approach Path Indicator	**SAMS**	Special Use Airspace Management System
PBN	Performance-Based Navigation	**SATCOM**	Satellite Communication Network
PDARS	Performance Data Analysis and Reporting System	**SAWS**	Stand-Alone Weather Sensor
Ph.	Phase	**SBAS**	Satellite-Based Augmentation System
PIREPS	Pilot Reports	**SBS**	Surveillance and Broadcast Services
PRM E-Scan	Precision Runway Monitor Electronic Scan	**SCT**	Safety Collaboration Team
PRM-R	Precision Runway Monitor Replacement	**SDAT**	Sector Design and Analysis Tool
PS3	Power Systems Sustained Support	**SE**	System Engineering
Qn	Calendar Quarter n (n = 1-4)	**Segmt.**	Segment
R&D	Research & Development	**SIM**	Surveillance Interface Modernization
RCE	Radio Control Equipment	**SLEP**	Service Life Extension Program
RCF	Radio Communication Facility	**SMA**	Surface Movement Advisor
RCL	Radio Communications Link	**SMGCS**	Surface Movement Guidance and Control System
RCOM	NAS Recovery Communications	**SOA**	Service Oriented Architecture
RDVS	Rapid Deployment Voice Switch	**SOCC**	Security Operations Control Center

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Appendix A, Acronym List (6 of 6)

Acronym	Definition	Acronym	Definition
SSMT	System Safety Management Transformation	**UIS**	Unstaffed Infrastructure Sustainment
STARS	Standard Terminal Automation Replacement System	**URET**	User Request Evaluation Tool
STDDS	SWIM Terminal Data Distribution System	**USNS**	United States NOTAM Service
STVS	Small Tower Voice Switch	**VASI**	Visual Approach Slope Indicator
SVGS	Synthetic Vision Guidance System	**VHF/UHF/HF**	Very High Frequency/Ultra High Frequency/High Frequency
SVS	Synthetic Vision System	**VNAV**	Vertical Navigation
S/W	Software	**VOR**	VHF Omnidirectional Range
SWIM	System-Wide Information Management	**VOR MON**	VOR Minimum Operating Network
TACAN	Tactical Air Navigation	**VORTAC**	VOR with TACAN
TAMR	Terminal Automation Modernization and Replacement	**VOT**	VHF Omnidirectional Range Test
TARGETS	Terminal Area Route Generation Evaluation and Traffic Simulation	**VRRP**	Voice Recorder Replacement Program
TAWS	Terrain Awareness and Warning System	**VSBP**	Voice Switch Bypass
TBA	Trajectory-Based Airspace	**VSCS**	Voice Switching and Control System (ARTCC)
TBFM	Time-Based Flow Management	**VTABS**	Voice Switching and Control System : Training and Backup System
TBO	Trajectory-Based Operations	**WAAS**	Wide-Area Augmentation System
TCAS	Traffic Alert and Collision Avoidance System	**WAM**	Wide Area Multilateration
TDLS	Tower Data Link Services	**WARP**	Weather and Radar Processor
TDWR	Terminal Doppler Weather Radar	**WEF**	Wind Equipment Series F
TE	Technology Enhancements	**WINS**	Weather Information Network Server
TFDM	Terminal Flight Data Manager	**WJHTC**	William J. Hughes Technical Center (FAA)
TFM	Traffic Flow Management	**WME**	Wind Measurement Equipment
TFMS	Traffic Flow Management System	**WMS**	WAAS Master Station
TFR Bldr	Temporary Flight Restriction Builder	**WMSCR**	Weather Message Switching Center Replacement
TIS-B	Traffic Information Service-Broadcast	**WPn**	Work Package n (n = 1, 2, …N)
TR	Technology Refresh	**WSDS**	Wind Shear Detection Services
TRACON	Terminal Radar Approach Control	**WSP**	Weather System Processor
TVSR	Terminal Voice Switch Replacement	**WT**	Wake Turbulence
TWIP	Terminal Weather Information for Pilots	**WTMA**	Wake Turbulence Mitigation for Arrivals
UAS	Unmanned Aircraft System	**WTMD**	Wake Turbulence Mitigation for Departures
UFPF	United Flight Planning and Filing	**Wx**	Weather

APPROVED